

SYLLABUS

for Courses affiliated to the

Kerala University of Health Sciences

Thrissur 680596



**BACHELOR OF
PHYSIOTHERAPY (BPT)**

Course Code: 011

(2016-17 Academic year onwards)

2016

2. COURSE CONTENT

2.1 Title of course:

BACHELOR OF PHYSIOTHERAPY DEGREE

2.2 Objectives of course

As per WHO's International Classification of Health Workers, based on the International Standard Classification of Occupations (ISCO, 2008 revision) – "Physiotherapists assess, plan and implement rehabilitative programs that improve or restore human motor functions, maximize movement ability, relieve pain syndromes, and treat or prevent physical challenges associated with injuries, diseases and other impairments. They apply a broad range of physical therapies and techniques such as movement, ultrasound, heating, laser and other techniques. They may develop and implement programmes for screening and prevention of common physical ailments and disorders."

This undergraduate course in Physiotherapy (BPT) aims to impart in depth knowledge and skill to a student to become competent in the techniques and develop the proper attitude required for the independent and autonomous practice of Physiotherapy. Specific objectives are:

- i. Acquisition of adequate theoretical and the practical knowledge and foundation in the basic medical subjects.
- ii. Proficiency in the skills of basic Physiotherapy procedures and techniques with adequate theoretical basic of allied sciences.
- iii. Ability to detect patho-physiological impairment of structural and functional deviations by using methodology of physical diagnosis to evaluate the disability prognosis.
- iv. Competency in imparting the physiotherapeutic measure of specific choice towards preventive, curative, symptomatic and restorative or rehabilitative goals.
- v. Acquisition of moral and ethical codes and conduct of professional practice in a dedicated manner with the patient welfare as the primary responsibility.

vi. After achieving competency and skill, a Physiotherapist should practice Physiotherapy, and carry out treatment as an independent practitioner or in consultation & reference with other medical practitioners.

2.3 Medium of instruction:

Medium of instruction and examinations shall be in English.

2.4 Course outline

The Bachelor of Physiotherapy degree program is a four year program with an additional six months of compulsory rotating internship. The professional degree program consists of classroom lectures, practical and laboratory demonstrations, bed side clinics, self directed academic activities and clinical postings.

In the first year theoretical and practical basis of fundamental health care subjects such as anatomy, physiology, biochemistry, human biomechanics and kinesiology, psychology and sociology are learnt.

In the second year, the students learn the disease processes through pathology and microbiology, apart from pharmacology and the theoretical and practical basis of exercise therapy and electrotherapy. The students will also be posted on rotating basis in various departments of the hospitals for clinical observation so as to gain an insight into various areas of functioning of a health care institution.

During the third year the students will be trained in the theoretical, practical and clinical basis of physiotherapy assessment and treatment of various clinical conditions in cardio respiratory medicine and surgery, general medicine and surgery, paediatrics, women's health, burns and skin diseases, intensive care units and community medicine. They will also be posted on a rotating basis in the above mentioned departments for gaining hands on experience in assessing and treating patients.

During the fourth year the students will be trained in the theoretical, practical and clinical basis of physiotherapy assessment and treatment of various clinical conditions in orthopaedics and trauma, rheumatology, sports medicine, neurology and neurosurgery and community health. They will also be posted on a rotating basis in the above mentioned departments for gaining hands on experience in assessing and treating patients.

2.5 Duration

The duration of the course shall be four and half years including Compulsory Internship of six months.

2.6 Syllabus

ANATOMY

Course Description

It is designed to provide students with the working knowledge of the structure of the human body which is an essential foundation for their clinical practice. Studies are concerned with the topographical and functional anatomy of the limb's, thorax and head & neck. Particular attention is paid to the muscles, fasciae, bones and joints of these regions. The abdomen, pelvis, perineum, head and neck and central nervous system (CNS) are studied with particular reference to topics of importance to physiotherapists. The study of the CNS includes detailed consideration of the control of motor function.

Subject Title: Anatomy

Duration: 0-12 Months

Total Hours: 320

Theory: 160 Hrs

Practical: 160 Hrs

Total Hours/Week: 8 Hrs

Method of Assessment: Written, Oral, Practical

***** - Must Know ** - Desirable to know * - Nice to know**

THEORY

1. Histology [5 Hours] **

General histology, study of the basic tissues of the body; Microscope, Cell, Classification of epithelial & connective tissues, Cartilage, Bone, Muscular Tissue-TS & LS, Circulatory system-Large sized artery, medium sized artery, large sized vein, Nervous tissues, Skin and its appendages.

2. Embryology [5 Hours]*

a) Ovum, Spermatozoa fertilization and formation of the Germ layers and their derivations (brief outline). b) Development of bones, axial and appendicular skeleton and muscles, c) Neural tube and spinal cord, d) Development of brain and brain stem structures.

3. Regional Anatomy

Thorax: [20 Hours]

a. Cardio-vascular System***

Mediastinum: Divisions and contents Pericardium : Thoracic Wall: position, shape and parts of the heart; conducting System; blood Supply and nerve supply of the heart; names of the blood vessels and their distribution in the body- region wise.

b. Respiratory system

Outline of respiratory passages** Pleura and lungs: position, parts relations, blood supply and nerve supply;** Lungs- emphasize on broncho-pulmonary segments.***

Diaphragm: Origin, insertion, nerve supply and action, openings in the diaphragm.***

***Intercostals muscles and Accessory muscles of respiration: Origin, insertion, nerve supply and action.

Abdomen [5 Hours]

c. Peritoneum: Parietal peritoneum, visceral peritoneum, folds of peritoneum, functions of peritoneum.*

d. Large blood vessels of the gut**

e. Location, size, shape, features, blood supply, nerve supply and functions of the following: stomach, liver, spleen, pancreas, kidney, urinary bladder, intestines, gall bladder.**

Pelvis: [5 Hours]

f. Position, shape, size, features, blood supply and nerve supply of the male and female reproductive system. Pelvic girdle (joints) and muscles at the pelvic floor, Comparison of female and male pelvis. **

Endocrine glands (Brief outline): [5 Hours]

g. Position, shape size function blood supply and nerve supply of the following glands: Hypothalamus and pituitary gland**, thyroid glands**, parathyroid glands**, Adrenal glands**, pancreatic islets*, ovaries and testes**, pineal glands*, thymus*.

4. Musculo Skeletal Anatomy-(All the topics to be taught in detail) [15 Hours]

*** a) Anatomical positions of body, axes, planes, common anatomical terminologies (Groove, tuberosity, trochanters etc)

c) Bones Composition & functions, classification and types according to morphology and development.

d) Joints-definition-classification, structure of fibrous, cartilaginous joints, synorrial joints blood supply and nerve supply of joints.

e) Muscles - origin, insertion, nerve supply and actions.

f) Applied clinical anatomy related to the above topics.

g) Anatomy of the fascial layers of human body

5. Upper Extremity: [30 Hours]

- a. Osteology: Clavicles, Scapula, Humerus, Radius, Ulna, Carpals, Metacarpals, Phalanges.*** Ossification of individual bones.*
- b. Soft parts: ***Breast, pectoral region, axilla, front of arm, back of arm, cubital fossa, front of fore arm, back of fore arm, palm, dorsum of hand, muscles, nerves, blood vessels and lymphatic drainage of upper extremity.
- c. Joints: ***Shoulder girdle, shoulder joint, elbow joints, radio ulnar joint, wrist joint and joints of the hand.
- d. Superficial & Deep palmer arches of hand, skin of the palm and dorsum of hand.**
- e. Applied/Clinical anatomy related to the above topics.**

6. Lower Extremity: [30 Hours]

- a. Osteology : ***Hip bone, femur, tibia, fibula, patella, tarsals, metatarsals** and phalanges**. Ossification of individual bones.*
- b. Soft parts:*** Gluteal region, front and back of the thigh (Femoral triangle, femoral canal and inguinal canal), medial side of the thigh (Adductor canal), lateral side of the thigh, popliteal fossa, anterior and posterior, compartment of leg, sole of the foot, lymphatic drainage of lower limb, venous drainage of the lower limb, arterial supply of the lower limb, arches of foot***, skin of foot*.
- c. Joints: ***Hip Joint, Knee joint, Ankle joint, joints of the foot. d. Applied/Clinical anatomy related to the above topics.**

7. Head, Neck and Spine [20 Hours]

- a. Osteology: *** Mandible and bones of the skull, paranasal sinuses (Brief outline)
- b. Soft parts: **Muscles of the face and neck and their nerve and blood supply-extra ocular muscles, triangles of the neck,

c. Gross anatomy of eyeball, nose, ears and tongue *(Brief outline).

d. Spine. ***– Structure and function, Lumbo Pelvic Rhythm** a. Osteology:

Cervical, thoracic, lumbar, sacral and coccygeal vertebrae and ribs b. Soft tissue:

Pre and Para vertebral muscles, intercostals muscles, anterior abdominal wall muscles,

Inter-vertebral disc & joints. e. Applied/ Clinical related to Anatomy above topics.**

8. Neuro Anatomy [20 Hours]

a. Organization of Central Nervous system -Spinal nerves and autonomic nervous system mainly pertaining to cardiovascular, respiratory and urogenital system ***

b. Cranial nerves (II,V,VII,XI ***) (I,III,IV,VI,VIII,IX,X,XII**)

c. Peripheral nervous system*** 1. Peripheral nerves 2. Neuromuscular junction 3. Sensory end organs

d) Central Nervous System 1. Spinal segments and areas*** 2. Brain Stem** 3.

Cerebellum** 4. Inferior colliculi* 5. Superior olliculi* 6. Thalamus** 7. Hypothalamus**

8. Corpus striatum* 9. Cerebral hemisphere*** 10. Lateral ventricles** 11. Blood supply

to brain*** 12. Basal Ganglia** 13. The pyramidal system* 14. Pons, medulla, extra

pyramidal systems** 15. Anatomical integration.* 16. Applied /Clinical Anatomy related

to the above topics.**

PRACTICAL [160 Hours]

List of Practical / Demonstrations

*** Topics – With Emphasis on Structure and Function of Joints, Muscles and on Human body as a Kinematic chain.**

1. Upper extremity Anatomy

2. Lower extremity Anatomy

3. Head & Spinal cord and Neck and Brain including surface Anatomy

4. Thorax including surface anatomy, abdominal muscles, joints, Diaphragm

5. Embryology- Histology-Elementary tissue including surface Anatomy

6. a. Demonstration of the muscles of the whole body and organs in Thorax and Abdomen in a cadaver b. Demonstration of movements & discuss about the range of motion (ROM) in important joints. c. Surface marking of the lung, pleura, fissures and lobes of lungs, heart, liver, spleen and muscles. d. Kidney, cranial nerves, spinal nerves and important blood vessels. e. Identification of body prominences on inspection and by palpation especially of extremities. f. Points of palpation of muscles, tendons, bones, joints, ligaments, nerves and arteries

PHYSIOLOGY

Course Description

The course in Physiology over the first year is designed to provide an understanding of the physiology of human body, with the ultimate aim to have a firm knowledge of physiological reactions to Exercise and Physical activity. The major topics covered include the following: Basic Physiology of the Nervous, Cardiovascular, Respiratory, Digestive, Excretory, Reproductive and Endocrine system with focus on the effects of various exercises and physical activities.

Practical classes include hematology experiments, clinical examinations, amphibian chart, and recommended demonstrations.

Subject Title: PHYSIOLOGY

Duration: 0- 12 Months

Total Hours: 320

Theory: 160Hrs

Practical: 160 Hrs

Total Hours / Week: 8 Hrs

Method of Assessment: Written, Oral, Practical

(Note: Must Know ***, Desirable to Know**, Nice to Know*)

THEORY

General Physiology [3 Hrs] *

- Cell: Morphology. Organelles: their structure and functions *
- Transport Mechanisms across the cell membrane *
- Body fluids: Distribution, composition. Tissue fluid - formation. *

Blood [10 Hrs]

Introduction: Composition and functions of blood. *

Plasma : Composition, formation, functions. Plasma proteins. *

RBC : Count and its variations. Erythropoiesis-stages, factors regulating. *

Reticulo-endothelial system (in brief) Hemoglobin - Anaemia (in detail), types of Jaundice. Blood indices, PCV, ESR. *

- WBC: Classification. Morphology, functions, count, its variation of each. Immunity **
- Platelets: Morphology, functions, count, its variations **
- Haemostatic mechanisms: Blood coagulation-factors, mechanisms. Their disorders. Anticoagulants. **
- Blood Groups: Landsteiner's law. Types, significance, determination, Erythroblastosis foetalis. **
- Blood Transfusion: Cross matching. Indications and complications. *
- Lymph: Composition, formation, circulation and functions. *

Nerve Muscle Physiology [25 Hrs] ***

- Introduction: Resting membrane potential. Action potential - ionic basis and properties.
- Nerve: Structure and functions of neurons. Classification, Properties and impulse transmission of nerve fibres. Nerve injury -degeneration and regeneration.
- Neuroglia: Types and functions.
- Muscle: Classification. Skeletal muscle: Structure. Neuromuscular junction : Structure. Neuromuscular transmission, myasthenia gravis. Excitation- Contraction coupling. Rigormortis. Motor unit. Properties of skeletal muscles, Strength- Duration curve, Length-tension relationship, fatigue, load.
- Smooth muscle: Structure, types, mechanism of contraction. Plasticity.

Cardiovascular System [15 Hrs] ***

- Introduction: Physiological anatomy and nerve supply of the heart and blood vessels. Organization of CVS. Cardiac muscles: Structure. Ionic basis of action potential and pacemaker potential. Properties.
- Conducting system: Components. Impulse conduction, Cardiac Cycle: Definition. Phases of cardiac cycle. Pressure and volume curves. Heart sounds - causes, character. ECG: Definition. Different types of leads. Waves and their causes. P-R interval. Heart block.
- Cardiac Output: Definition. Normal value. Determinants. Stroke volume and its regulation. Heart rate and its regulation. Their variations
- Arterial Blood Pressure: Definition. Normal values and its variations.
Determinants. Regulation of BP.
- Arterial pulse.
- Shock - Definition. Classification-causes and features

- Regional Circulation: Coronary, Cerebral and Cutaneous circulation..

Respiratory System [15Hrs] ***

- Introduction: Physiological anatomy - Pleura, tracheo-bronchial tree, alveolus, respiratory membrane and their nerve supply. Functions of respiratory system. Respiratory muscles.
- Mechanics of breathing: Intrapleural and Intrapulmonary pressure changes during respiration. Chest expansion. Lung compliance: Normal value, pressure-volume curve, factors affecting compliance and its variations. Surfactant - Composition, production, functions. RDS
- Spirometry: Lung volumes and capacities. Timed vital capacity and its clinical significance. Maximum ventilation volume. Respiratory minute volume.
- Dead Space: Types and their definition.
- Pulmonary Circulation. Ventilation-perfusion ratio and its importance.
- Transport of respiratory gases: Diffusion across the respiratory membrane. Oxygen transport -Different forms, oxygen-hemoglobin dissociation curve. Factors affecting it. P50, Haldane and Bohr effect. Carbon dioxide transport: Different forms, chloride shift.
- Regulation of Respiration: Neural Regulation. Hering-breuer's reflex. Voluntary control. Chemical Regulation.
- Hypoxia: Effects of hypoxia. Types of hypoxia, Hyperbaric oxygen therapy. Acclimatization Hypercapnoea. Asphyxia. Cyanosis - types and features. Dysbarism
- Disorders of Respiration: Dyspnoea. Orthopnoea. Hyperpnoea, hyperventilation, apnoea, tachypnoea. periodic breathing - types
- Artificial respiration

Digestive System [5 Hrs]

- Introduction: Physiological anatomy and nerve supply of alimentary canal. Enteric nervous system*

- Salivary Secretion: Saliva: Composition. Functions. Regulation. Mastication (in brief)*
- Swallowing : Definition Different stages, Functions.*
- Stomach: Function, Gastric Juice: Gland, composition, function, regulation. Gastrin: PRODUCTION, FUNCTION AND REGULATION. Peptic ulcer, Gastric motility. Gastric emptying. Vomiting.*
- Pancreatic Secretion: Composition, production, function..**
- Liver: Function of liver. Bile secretion: Composition, functions and regulation. Gall bladder: Functions. **
- Intestine: Succus entericus: Composition, function of secretion. Intestinal motility and its function and regulation.*
- Mechanism of Defaecation. *

Renal System [5 Hrs]

- Introduction: Physiological anatomy, Nephrons – cortical, and juxtamedullary. Juxta glomerular apparatus. Glomerular membrane. Renal blood flow and its regulation. Functions of kidneys. ***
- Mechanism of urine Formation: Glomerular Filtration: GFR – normal value and factors affecting.. Renal clearance. Insulin clearance.***
- Tubular Reabsorption: Reabsorption of Na⁺, glucose,, HCO₃⁻. Urea and water. Filtered load
Renal tubular transport maximum. Glucose clearance. .Renal threshold for glucose. ***
- Tubular Secretion: Secretion of, H⁺ and K⁺, PAH Clearance. ***
- Micturition: Mechanism of micturition. . Atonic bladder, automatic bladder. ***
- Acid – Base balance (very brief) ***
- Skin and temperature regulation. ***

Endocrine System [5 Hrs] (Emphasis on regulation and functions only)

- Introduction: Major endocrine glands. Hormone: classification, mechanism of action. Functions of hormones.**
- Pituitary Gland: Anterior Pituitary and Posterior pituitary hormones: Secretory cells, action on target cells, regulation of secretion of each hormone. Disorders: Gigantism, Acromegaly, Dwarfism,*
- Diabetes Insipidus. Physiology of growth and development: hormonal and other influences.**
- Thyroid Gland: Thyroid hormone and calcitonin: secretory cells, synthesis, storage, action and regulation of secretion. Disorders: Myxoedema, Cretinism, Grave's disease.**
- Parathyroid hormones: secretory cells, action, regulation of secretion: Disorders: Hyperparathyroidism.**
- Adrenal Gland: Adrenal Cortex: Secretory cells, synthesis, action, regulation of secretion of Aldosterone, Cortisol,. Disorders: Addison's disease, Cushing's syndrome, Conn's syndrome, Adrenogenital syndrome. Adrenal Medulla: Secretory cells, action. Disorders: Pheochromocytoma.*
- Endocrine Pancreas: Secretory cells, action,. Regulation of secretion of insulin and glucose, Glucose metabolism and its regulation. Disorder: Diabetes mellitus.***

Reproductive System [5 Hrs]

- Introduction: Physiological anatomy reproductive organs. Sex determination. Sex differentiation. Disorder ***
- Male Reproductive System: Functions of testis. Pubertal changes in males. Spermatogenesis.***
- Testosterone: action.**

- Female Reproductive System: Functions of ovaries and uterus. Pubertal changes in females. Oogenesis. Hormones: estrogen and progesterone-action.. Menstrual Cycle. Hormonal, basis. Menarche. Menopause. Pregnancy: Pregnancy tests. Physiological changes during pregnancy. Functions of placenta. Lactation. Contraception methods.***

Special Senses [7 Hrs]

- Vision: Introduction: Functional anatomy of eye ball. Functions of cornea, iris, pupil, aqueous humor- glaucoma, lens- cataract, vitreous humor, rods and cones. Photopic vision. Scotopic vision. **
- Visual pathway and the effects of lesions**
- Refractive Errors: Myopia,. Hypermetropia, presbyopia and astigmatism.**
- Visual Reflexes. Accommodation, papillary and light. Visual acuity and Visual field. Light adaptation. Dark adaptation. Color vision –color blindness. Nyctalopia.**
- Audition: Physiological anatomy of the ear. Functions of external ear, middle ear and inner ear Structure of Cochlea and organ of corti. Auditory pathway. Types of Deafness. Tests for, hearing. Audiometry.**
- Taste: Taste buds. Primary tastes. Gustatory pathway.*
- Smell: Olfactory membrane. Olfactory pathway.*
- Vestibular Apparatus: Crista Ampullaris and macula. Functions and its Disorders.***

Nervous System [25 Hrs]

- Introduction: Organization of CNS - central and peripheral nervous system. Functions of nervous system. Synapse: Functional anatomy, classification, Synaptic transmission. Properties. • Sensory Mechanism: Sensory receptors: function, classification and properties. Sensory pathway: The ascending tracts — Posterior column tracts, lateral spinothalamic tract and the anterior spinothalamic tract - their origin, course, termination and functions. The trigeminal pathway. Sensory cortex. Somatic sensations:

crude touch, fine touch, tactile localization, tactile discrimination, stereognosis, vibration sense, kinesthetic sensations. Pain sensation: mechanism of pain. Cutaneous pain -slow and fast pain, hyperalgesia. Deep pain. Visceral pain - referred pain. Gate control theory of pain, tabes dorsalis, sensory ataxia.***

- Motor Mechanism: Motor Cortex. Motor pathway: The descending tracts – pyramidal tracts, extrapyramidal tracts - origin, course, termination and functions. Upper motor neuron and lower motor neuron. Paralysis, monoplegia, paraplegia, hemiplegia and quadriplegia.***
- Reflex Action: components, Bell-Magendie law, classification and Properties. Monosynaptic and polysynaptic reflexes, superficial reflexes, deep reflexes. Stretch reflex structure of muscle spindle, pathway, higher control and functions. Inverse stretch reflex. Muscle tone - definition, and properties hypotonia, atonia and hypertonia. UMNL and LMNL***
- Spinal cord Lesions: Complete transection and Hemisection of the spinal cord.***
- Cerebellum: Functions. Cerebellar ataxia.***
- Posture and Equilibrium: Postural reflexes -spinal, medullary, midbrain and cerebral reflexes.***
- Thalamus and Hypothalamus: Nuclei. Functions. Thalamic syndrome***
- Reticular Formation and Limbic System: Components and Functions.***
- Basal Ganglia: Structures included and functions. Parkinson's disease.***
- Cerebral Cortex: Lobes. Brodmann's areas and their functions. Higher functions of cerebral cortex - learning, memory and speech.***
- EEG : Waves and features. Sleep: REM and NREM sleep.***
- CSF: Formation, composition, circulation and functions. Lumbar puncture and its significance. Blood brain barrier. Hydrocephalus. ***
- ANS: Features and actions of parasympathetic and sympathetic nervous system.***

Physiology of Exercise [20 Hrs] ***

A. Effects of exercise and physical activities on

- 1) O₂ transport
- 2) Muscle strength/power/endurance
- 3) Basal Metabolic Rate / Respiratory Quotient
- 4) Hormonal and metabolic effect
- 5) Cardiovascular system
- 6) Respiratory system
- 7) Body fluids and electrolyte

B. Effect of gravity / altitude /acceleration / pressure on physical parameters

C. Energy expenditure and fatigue

D. Body Composition

E. Physical Activity for Health and Fitness

F. Physiology of Exercise in various age groups and diseases

D. Criteria for prescription of exercises

Applied Physiology [20 Hrs]

More detailed study of the physiology and practical applications of the following selected topics with emphasis on aspects, which should help in understanding the nature and treatment of common clinical situations of interest in Physiotherapy.

a. Pulmonary Functions ***

1. Properties of gases, Mechanics of respiration, Diffusion capacity, special features of pulmonary circulation and their application.

2. Respiratory adjustments in exercises.

3. Artificial respiration

4. Breath sounds.

b. Cardio vascular Functions***

1. Blood flow through arteries, arterioles, capillaries, veins and venules.

2. Circulation of Lymph, Oedema

3. Factors affecting cardiac Output

4. Circulatory adjustment in exercise and in postural and gravitational changes,

5. Patho physiology of fainting and heart failure.

c. Muscles and Nervous System Functions ***

1. Peripheral nervous system, Neuromuscular transmission, Types of nerve fibres.

2. Action potential, Strength-duration curve, ECG, EMG, VEP, NCV

3. Degeneration and regeneration of nerve, Reactions of denervations.

4. Synaptic transmission, Stretch reflex-Mechanism and factors affecting it.

5. Posture, Balance and Equilibrium/Coordination of voluntary movement

6. Voluntary motor action, clonus, Rigidity, incoordination,

7. Special senses- Vision, taste, hearing, vestibular, Olfaction

8. Sympathetic and Parasympathetic regulation, Thermoregulation.

d. Blood functions**

1. Thalassemia Syndrome, Hemophilia, VWF

2. Anemia, Leucocytosis

3. Bone marrow transplant

e. Metabolic Functions **

Diabetes Mellitus***, Physiological basis of Peptic Ulcer, Jaundice, GIT disorders and Dietary fiber, Thyroid functions, Vitamins deficiency.

PRACTICAL 160 Hrs

I. Haematology

To be done by the students

1. Study of Microscope and its uses
2. Determination of blood groups
3. Determination of bleeding time
4. Determination of clotting time

Demonstrations only

1. Determination of ESR
2. Determination of PC V

II. Clinical Examination

To be done by the students

1. Examination of Radial pulse.
2. Recording of blood pressure
3. Examination of CVS
4. Examination of Respiratory system
5. Examination of sensory system
6. Examination of Motor System
7. Examination of reflexes

III. Demonstrations

1. Spirometry, Body Composition, Exercise testing.
2. Ergometry, Artificial Respiration
3. ECG, EEG

BIOMECHANICS

Course Description

Kinesiology and Biomechanics involves the study of basic concepts of human movement, and application of various biomechanical principles in the evaluation, diagnosis and treatment of movement and structural disorders of musculoskeletal system. Students are taught to understand the various quantitative and qualitative methods of evaluation of movement. Mechanical principles of various treatment methods are studied. Study and management of deviations in posture, ADL and gait are also an integral part.

Title: Biomechanics

Duration: 0-12 Months

Total Hours: 320 Hrs

Theory: 160 Hrs

Practical: 160 Hrs

Total Hours/week: 8

Method of Assessment: Written

THEORY

1. Basic Concepts in Biomechanics: Kinematics and Kinetics [25Hrs]

- a) Types of Motion
- b) Location of Motion
- c) Direction of Motion

d) Magnitude of Motion

e) Definition of Forces

f) Force of Gravity

g) Reaction forces

h) Equilibrium

i) Objects in Motion

j) Force of friction

k) Concurrent force systems

l) Parallel force systems

m) Work

n) Moment arm of force

o) Force components

p) Equilibrium of levers

2. Joint structure and Function [20 Hrs]

a) Joint design

b) Materials used in human joints

c) General properties of connective tissues

d) Human joint design

e) Joint function

f) Joint motion

g) General effects of disease, injury and immobilization.

3. Muscle structure and function [15 Hrs]

- a) Mobility and stability functions of muscles
- b) Elements of muscle structure
- c) Muscle function
- d) Effects of immobilization, injury and aging

4. Biomechanics of the Thorax and Chest wall [10 Hrs]

- a) General structure and function
- b) Rib cage and the muscles associated with the rib cage
- c) Ventilatory motions: its coordination and integration
- d) Developmental aspects of structure and function
- e) Changes in normal structure and function - relation to pregnancy, scoliosis and COPD

5. The Temporomandibular Joint [5 Hrs]

- a) General features, structure, function and dysfunction

6. Biomechanics and kinesiology of the vertebral column [15Hrs]

- a) General structure and function
- b) Regional structure and function – Cervical region, thoracic region, lumbar region, sacral region
- c) Muscles of the vertebral column
- d) General effects of injury and aging

7. Biomechanics and kinesiology of the peripheral joints [45 Hrs]

- a) The shoulder complex: Structure and components of the shoulder complex and their integrated function.

b) The elbow complex: Structure and function of the elbow joint – humeroulnar and humeroradial articulations, superior and inferior radioulnar joints; mobility and stability of the elbow complex; the effects of immobilization and injury.

c) The wrist and hand complex: Structural components and functions of the wrist complex; structure of the hand complex; prehension; functional position of the wrist and hand.

d) The hip complex: structure and function of the hip joint; hip joint pathology- arthrosis, fracture, bony abnormalities of the femur.

e) The knee complex: structure and function of the knee joint – tibiofemoral joint and patellofemoral joint; effects of injury and disease.

f) The ankle and foot complex.: structure and function of the ankle joint, subtalar joint, talocalcaneonavicular joint, transverse tarsal joint, tarsometatarsal joints, metatarsophalangeal joints, interphalangeal joints, structure and function of the plantar arches, muscles of the ankle and foot, deviations from normal structure and function – Pes Planus and Pes Cavus

8. Biomechanics and kinesiology of Posture, ADL and Gait [25 Hrs]

Static and dynamic posture, postural control, kinetics and kinematics of posture, ideal posture analysis of posture, effects of posture on age, pregnancy, occupation and recreation; general features of gait, gait initiation, kinematics and kinetics of gait, energy requirements, kinematics and kinetics of the trunk and upper extremities in relation to gait, stair case climbing and running, effects of age, gender, assistive devices, disease, muscle weakness, paralysis, asymmetries of the lower extremities, injuries and malalignment in gait; Movement Analysis : ADL activities like sitting – to standing, lifting, various grips , pinches.

PRACTICAL: [160 Hrs]

Practical shall be conducted for various joint movements and analysis of the same. Demonstrations should also be given as how to analyze posture and gait. The student shall be taught and demonstrated to analysis for activities of daily living – ADL – (like

sitting to standing, throwing, lifting etc.) The student should be able to explain and demonstrate the movements occurring at the joints, the muscles involved, the movements or muscle action produced, and mention the axis and planes through which the movements occur. The demonstrations may be done on models or skeleton.

PSYCHOLOGY

Course description

Human Psychology involves the study of various behavioural patterns of individuals, theories of development, normal and abnormal aspects of motor, social, emotional and language development, communication and interaction skills appropriate to various age groups. The study of these subjects will help the student to understand their clients while assessment and planning appropriate treatment method.

Subject Title: PSYCHOLOGY

Duration: 0-12 Months

Total Hours: 80

Theory: 80

Total Hours/week: 2 Hrs

Method of Assessment: Written

Theory

1. Introduction to Psychology [8 Hrs]

- a. Schools: Structuralism, functionalism, behaviorism, psychoanalysis.
- b. Methods: Introspection, observation, inventory and experimental method.
- c. Branches: Pure psychology and applied psychology
- d. Psychology and Physiotherapy

2. Growth and Development [5 Hrs]

- a. Life span: different stages of development (Infancy, childhood, adolescence, adulthood, middle age, old age).
- b. Heredity and environment: role of heredity and environment in physical and psychological development, —"Nature v/s Nurture controversy"

3. Sensation, attention and perception [8 Hrs]

- a. Sensation: Vision, Hearing, Olfactory, Gustatory and Coetaneous sensation, movement, equilibrium and visceral sense.
- b. Attention: Types of attention, Determinants and objective determinants
- c. Perception: Gestalt principles of organization of perception (principle of figure ground and principles of grouping), factors influencing perception (past experience and context)
- d. Illusion and hallucination: different types

4. Motivation (5 Hours)

- a. Motivation cycle (need, drive, incentive, reward).
- b. Classification of motives.
- c. Abraham Maslow's theory of need hierarchy

5. Frustration and conflict (5 Hours)

- a. Frustration: sources of frustration.
- b. Conflict: types of conflict.
- c. Management of frustration and conflict

6. Emotions (6 Hours)

a. Three levels of analysis of emotion (physiological level, subjective state, and overt behavior).

b. Theories of emotion

c. Stress and management of stress

7. Intelligence (6 Hours)

a. Theories of intelligence.

b. Distribution of intelligence.

c. Assessment of intelligence

d. Types, Models and Assessment of Memory

8. Thinking (5 Hours)

a. Reasoning: deductive and inductive reasoning

b. Problem solving: rules in problem solving (algorithm and heuristic)

c. Creative thinking: steps in creative thinking, traits of creative people

9. Learning (8 Hours)

a. Factors effecting learning.

b. Theories of learning: trial and error learning, classical conditioning, Operant conditioning, insight learning, social learning theory.

c. The effective ways to learn: Massed/Spaced, Whole/Part, Recitation/Reading, Serial/Free recall, Incidental/Intentional learning, Knowledge of results, association, organization, and mnemonic methods.

10. Personality (8 Hours)

a. Approaches to personality: type & trait, behavioristic, psychoanalytic and humanistic approach.

b. Personality assessment: observation, situational test, questionnaire, rating scale, interview, and projective techniques.

c. Defense Mechanisms: denial of reality, rationalization, projection, reaction formation, identification, repression, regression, intellectualization, undoing, introspection, acting out.

11. Social psychology (4 Hours)

a. Leadership: Different types of leaders. Different theoretical approaches to leadership.

b. Attitude: development of attitude. Change of attitude.

12. Clinical Psychology (12 Hours)

a. Psychosomatic disorders – Definition and Basic Concepts

b. Coping strategies

c. Psychological counseling

SOCIOLOGY

Course description

Sociology will introduce student to the basic sociology concepts, principles and social, emotional and language development, communication and interaction skills appropriate to various age groups. Sociology will introduce student to the basic sociology concepts, principles and social process social institutions [in relation to the individual, family and community] and the various social factors affecting the family in rural and urban communities in India will be studied.

Subject Title: SOCIOLOGY

Duration: 0-12 Months

Total Hours: 80

Theory: 80

Total Hours/week: 2 Hrs

Method of Assessment: Written

THEORY

1. Introduction: [8 Hrs]

1. Meaning- Definition and scope of sociology
2. Its relation to Anthropology, Psychology, Social Psychology.
3. Methods of Sociological investigations- Case study, social survey, questionnaire, Interview and opinion poll methods.
4. Importance of its study with special reference to Health Care Professionals.

2. Social Factors in Health and disease situations: [3 Hrs]

1. Meaning of social factors
2. Role of social factors in health and illness

3. Socialization: [5 Hrs]

1. Meaning and nature of socialization
2. Primary, Secondary and Anticipatory socialization
3. Agencies of socialization

4. Social Groups: [5 Hrs]

1. Concepts of social groups, influence of formal and informal groups on health and sickness.
2. The role of primary groups and secondary groups in the hospital and rehabilitation setup.

5. Family: [8 Hrs]

1. The family, meaning and definitions.
2. Functions of types of family
3. Changing family patterns
4. Influence of family on the individuals health, family and nutrition, the effects of sickness in the family and psychosomatic disease and their importance to Physiotherapy.

6. Community: [5 Hrs]

1. Rural community: Meaning and features –Health hazards of ruralities, health hazards to tribal community.
2. Urban community: Meaning and features- Health hazards of urbanities.

7. Culture and Health: [8 Hrs]

1. Concept of Health
2. Concept of Culture
3. Culture and Health
4. Culture and Health Disorders

8. Social change: [10 Hrs]

1. Meaning of social changes.
2. Factors of social changes.
3. Human adaptation and social change
4. Social change and stress.
5. Social change and deviance.

6. Social change and health programme

7. The role of social planning in the improvement of health and rehabilitation.

9. Social Problems of disabled: [15 Hrs]

Consequences of the following social problems in relation to sickness and disability, remedies to prevent these problems.

1. Population explosion
2. Poverty and unemployment
3. Beggary
4. Juvenile delinquency
5. Prostitution
6. Alcoholism
7. Problems of women in employment
8. Geriatric problems
9. Problems of underprivileged.

10. Social Security: [5 Hrs]

Social security and social legislation in relation to the disabled.

11. Social worker: [8 Hrs]

1. Meaning of Social Work
2. The role of a Medical Social Worker

BIOCHEMISTRY

Course Description

At the completion of this course the student will have a basic knowledge about the importance of Biochemistry, such that he/ she shall be able to utilize it in the practice of Physiotherapy.

Subject: BIOCHEMISTRY

Duration: 0 – 12 months

Total hours: 80

Theory: 80

Total hours/ week: 2 hour

Method of Assessment: Written

THEORY

1. Cell (3 hours)

Introduction, Cell structure, Cell membrane structure & function, various types of absorption. Intracellular structure & their function.

2. Carbohydrates (10 hours)

Definition, General Classification with examples, Sources & Functions, Digestion and absorption, metabolism of carbohydrates, with emphasis on glycolysis, gluconeogenesis, HMP shunt pathway. Inborn errors associated with carbohydrates metabolism, regulation of blood glucose level, diabetes mellitus (aetiology, biochemical abnormalities, biochemical basis of complications, lab diagnosis).

3. Lipid chemistry (10 hours)

Definition, General Classification with examples, Sources & Functions, Digestion and absorption, metabolism of Lipids (fatty acid oxidation-beta and alpha oxidation, cholesterol synthesis,) Phospholipids, inborn errors, Atherosclerosis.

4. Proteins and amino acids (10 hours)

Definition, General Classification with examples, & Functions, Digestion and absorption, metabolism of Proteins - glycin, phenylalanine, thyrosine, Aminoacidurias

5. Integration of metabolism and Electron Transport Chain (4 hour)

6. Vitamins (4 hours)

Definition, classification according to solubility, Major Individual vitamins – sources, digestion, absorption, deficiency.

7. Mineral metabolism (4 hours)

Definition, Digestion, absorption, function. Examples of Disorders of individual Minerals – Iron, Copper

8. Water and Electrolyte Balance (5 hour)

Water distribution in the body, Body water, water turn over, Regulation of water balance, Distribution of electrolytes Electrolyte balance, Acid-base balance

9. Nucleotide, nucleic acid chemistry (5 hour)

Nucleotide chemistry, nucleotide composition and function of free nucleotides in the body, nucleic acid (DNA and RNA) chemistry, difference between DNA and RNA, structure and function of DNA, structure and function of RNA.

10. Clinical Bio chemistry (8 hours)

Normal level of blood & urine constituents, Relevance of blood & urine level of glucose, Renal and Liver function tests

11. Detoxification (3 hour)

12. Enzymes (4 hour)

Definition, classification, factors affecting enzyme activity, diagnostic enzymology

13. Hormones (4 hour)

Definition, classification, mechanism of action

14. Procedures in Bio chemistry (3 hour)

Electrophoresis, Chromatography, RIA, ELISA

15. Radioactivity (3 hour)

Diagnostics, Research & therapeutic applications, Radiation hazards

NUTRITION

Course Description

At the completion of this course the student will have a basic knowledge and understanding of Principles of Nutrition, such that he/ she shall be able to utilize it in the practice of Physiotherapy

Subject: NUTRITION

Duration: 0 – 12 months

Total hours: 40

Theory: 40

Total hours/ week: 1 hour

Method of Assessment: Written

THEORY

1. Introduction to nutrition, Role of nutrition in maintaining health. Nutritional problems in India. Factors affecting food and nutrition: socio - economic, cultural, tradition, production, system of distribution, life style and food habits etc. (5 Hrs)

2. Classification of foods. Food standards. Elements of nutrition: macro and micro. Energy, Unit of Energy – Kcal. Energy requirements of different categories of people.

Measurements of energy. Body Mass Index (BMI). Basal Metabolic Rate (BMR) – determination and factors affecting. Respiratory Quotient (RQ), Specific Dynamic Action (SDA). (4 hrs)

3. Carbohydrates : Caloric Value, Recommended daily allowances. Dietary sources. Functions. Malnutrition: Deficiencies and Over consumption. (5 hrs)

4. Fats: Caloric Value, Recommended daily allowance. Dietary sources, Functions. Malnutrition: Deficiencies and Over consumption. (5 hrs)

5. Proteins: Caloric Value, Biological Value (BV), Recommended daily allowance. Dietary sources. Functions. Malnutrition: Deficiencies and Over consumption. (5 hrs)

6. Vitamins: Caloric Value, Biological Value (BV), Recommended daily allowance. Dietary sources. Functions. Malnutrition: Deficiencies and Over consumption. (3 hrs)

7. Minerals Caloric Value, Biological Value (BV), Recommended daily allowance. Dietary sources. Functions. Malnutrition: Deficiencies and Over consumption. (3 hrs)

8. Balanced diet: Elements, Food groups. Recommended Daily Allowance. Nutritive value of foods. Understanding of balanced diet for different categories of people and patients Planning menu. (3 Hrs)

9. Assessment of nutritional status- Objectives. Diet survey – objectives and methods. (2 hrs)

10. Introduction to therapeutic diets: Types of Modification in diets. Diets in fever, Diarrhoea, Constipation, Ulcers, Diabetes, atherosclerosis, Renal Failure and Obesity. (5 hrs)

FIRST AID & NURSING

Course Description

At the completion of this course the student of First Aid and CPR must be able to identify and manage situation of common emergencies.

Subject Title: FIRST AID & NURSING

Duration: 0-12 Months

Total Hours: 80

Theory: 60

Practical: 20

Total Hours/week: 2 Hr

Method of Assessment: Written

THEORY (FIRST AID) [30 Hrs]

1. Importance of First Aid in Physiotherapy
2. Examination of Vital Signs.
3. First Aid in cardiac arrest.
4. First Aid in Respiratory failure.
5. First Aid in Burns.
6. First Aid in Electric shock.
7. First Aid in Drowning.
8. First Aid in Spinal cord injuries.
9. First Aid in Hypovolemic Shock.
10. First Aid in Poisoning
11. Instrumentation used in First Aid (First Aid kit).
12. First Aid in RTA.
13. Indication of CPR.

14. Assessment and technique of CPR.

15. Artificial ventilation.

PRACTICAL [10 Hrs]

THEORY (NURSING) [30 Hrs]

1. What is Nursing? Nursing principles. Inter-Personnel relationships. Bandaging: Basic turns; Bandaging extremities; Triangular Bandages and their application.
2. Nursing Position: Environment safety; Bed making, prone, lateral, dorsal, dorsal recumbent, Flower's positions, comfort measures, Aids for rest and sleep,
3. Lifting and Transporting Patients: Lifting Patients up in the bed. Transferring from bed to wheel chair. —Transferring from bed to stretcher||.
4. Bed side Management: Giving and taking Bed pan, Urinal : Observation of stools, urine. Observation of sputum, Understand use and care of catheters, enema giving.
5. Methods of Giving Nourishment: Feeding, Tube feeding, drips, transfusion
6. Care of Rubber Goods: Observation, Reporting and Recording Temperature, Respiration and Pulse, Simple aseptic Technique, Sterilization and Disinfection.
7. Surgical Dressing: Observation of dressing procedures

PRACTICAL [10 Hrs]

ORIENTATION TO PHYSIOTHERAPY

Subject Title: Orientation to Physiotherapy

Duration: 0 - 12 Months

Total Hours: 40

Theory: 40 Hrs

Total Hours/week: 1 Hr

Method of Assessment: Written

THEORY

I. Patterns of Health Care Delivery: (5 Hrs)

- a. National Trends and resources
- b. Local trends and resources
- c. Overview of Health Science Professions

II. Components of Physiotherapy Profession: (15 Hrs)

- a. History of Medical Therapeutics
- b. History of Physiotherapy – World and India
- c. Overview of Health Science Professions

III. Role of Physiotherapy in meeting Health Care Needs in India. (15 Hrs)

- a. Needs versus Demands
- b. Physiotherapist as “Educator”
- c. Typical Job settings
- d. Common problems and solutions.
- e. Introduction of Physical Assessment, Physical Diagnosis and Differential Diagnosis

IV. Responsibility Characteristics of being a professional (5 Hrs)

COMMUNICATIVE ENGLISH

Course description:

This course is designed to help the student acquire a good command and comprehension of the English language through individual, papers and conferences.

Subject Title: ENGLISH

Duration: 0 - 12 Months

Total Hours: 40

Theory: 40 Hrs

Total Hours/week: 1Hr

Method of Assessment: Written

THEORY

Behavioral Objectives:

The student at the end of training is able to

1. Read and comprehend English language
2. Speak and write grammatically correct English
3. Appreciates the value of English literature in personal and professional life,

Unit-I: [4 Hrs]

Introduction:

Study Techniques

Organization of effective note taking and logical processes of analysis and synthesis

The use of the dictionary

Enlargement of vocabulary Effective diction

Unit - II: [4 Hrs]

Applied Grammar:

Correct usage

The structure of sentences

The structure of paragraphs

Enlargements of Vocabulary

Unit - III: [4 Hrs]

Written Composition:

Precise writing and summarizing

Writing of bibliography

Enlargement of Vocabulary

Unit – IV [4 Hrs]

Reading and comprehension

Review of selected materials and express oneself in one's words.

Enlargement of Vocabulary

Unit –V [4 Hrs]

The Study of Various Forms of Composition Paragraph, Essay, Letter, Summary,
Practice in writing

Unit – VI [20 Hrs]

Verbal communication:

Discussions and summarization, Debates, Speech and Oral Verbal Communication:
Discussions and report making and their use in teaching.

II BPT

ELECTROTHERAPY

Course Description

In this course the student will learn the Principles, Techniques, Effects, Indications, Contra-indication and the dosage parameters for various electro therapeutic modalities in the restoration of physical function. The objective of this course is that after specified hours of lectures, demonstration, practical and clinics the student will be able to independently prescribe and carry out the Physiotherapy treatment using electrotherapy aids in various clinical conditions.

Title: ELECTROTHERAPY

Duration: 13-24 Months

Total Hours: 320Hrs

Theory: 120 Hrs

Practical: 200 Hrs

Total Hours/week: 8

Method of Assessment: Written, Oral, Practical

THEORY

Section I – Introductory Physics and Electrotherapy [10 Hrs]

1. History of Electrical Modalities and Electrotherapy
2. Electricity definition, types Static electricity

- a. Production of electrical charges.
- b. Characteristics of charged body.
- c. Characteristics of lines of force.
- d. Potential difference and EMG.

3. Current Electricity

- a. Units of Electricity, Faraday, volt, ampere, coulomb, watt.
- b. Resistance in series and parallel.
- c. Ohms law and its application to DC/AC.
- d. Fuse.
- e. Shock: Micro/Macro shocks, safety precaution and management, earthing techniques & precautions.
- f. Burns: electrical & chemical burns, prevention and management.
- g. Condensers Valves, transformers: types, principles, construction and working.

4. Magnetism: Definition, properties, electromagnetic induction, electromagnetic spectrum.

5. Ionization: Principles, effects of various technique of medical ionization.

Section II – Therapeutic Electricity

Section II A – Low frequency Currents [40 Hrs]

1. Basic types of current.

- a. **Direct Current:** types, physiological & therapeutic effects.
- b. **Alternating Current**

2. Types of current used in therapeutics

Modified DC

Faradic Current

Galvanic Current

Modified AC

Sinusoidal Current

Diadynamic Current

3. Faradic Current: Definition, Modifications, Techniques of application of individual, muscle stimulation, Physiological & Therapeutics effects of faradic Current, Precautions, Indications, & Contra indications, Dangers.

4. Galvanic Currents: Definition, Modifications, Physiological & Therapeutics effects of Galvanic Current, Indications, & Contraindications, Dangers. Effects of Interrupted galvanic current on normally innervated and denervated muscles and partially denervated muscles

5. Sinusoidal Current & diadynamic Current in Brief.

6. HVPGS - Parameters & its uses.

7. Ionization / Iontophoresis : Techniques of Application of Iontophoresis, Indications, Selection of Current, Commonly used ions (drugs) for pain, hyperhydrosis, wound healing, calcium deposits, sclerolytic action, fungal infection, edema reduction, inflammation & plantar warts. Current Amplitude and Treatment duration iontophoresis

8. Cathodal/ Anodal galvanism.

9. Micro Current & Macro Current

10. Types of Electrical Stimulators

NMES- Construction component

Neuro muscular diagnostic stimulator-construction component

Components and working Principles

11. Principles of Application: Electrode- tissue interface, Tissue Impedance. Types of Electrode Size & Placement of Electrode: Waterbath, Unipolar, Bi-polar, Electrode coupling, Current flow in tissues, Lowering of Skin Resistance.

12. Nerve Muscle Physiology: Action Potential, Resting membrane potential, Propagation of Action Potential, Motor unit. Synapse, Accommodation, Stimulation of Healthy Muscle, Stimulation of Denervated Muscle, Stimulation for Tissue Repair.

13. TENS: Define TENS, Types of TENS, Conventional TENS, Acupuncture TENS. Burst TENS, Brief & Intense TENS, Modulated TENS. Types of Electrodes & Placement of Electrodes, Dosage parameters, Physiological & Therapeutic, effects, Indications & Contraindications.

14. Pain: Define Pain. Theories of Pain (Outline only), Pain Gate Control theory in detail.

Section II B - Electro-diagnosis [15 hrs]

1. FG Test

2. SD Curve: Methods of Plotting SD Curve. Apparatus selection, Characters of Normally innervated Muscle. Characters of Partially Denervated Muscle, Characters of Completely denervated Muscle. Chronaxie & Rheobase.

3. Nerve conduction velocity studies

4. EMG: Construction of EMG equipment.

5. Bio-feed back.

Section II C - Medium Frequency [10 Hrs]

1. Interferential Therapy: Define IFT. Principle of Production of Interferential current, Static Interference System, Dynamic Interference system. Dosage Parameters for IFT, Electrode placement in IFT. Physiological & Therapeutic effects, Indications & Contraindications.

2. Russian Current

3. Rebox type Current

Section III - Thermo & Actinotherapy (High Frequency Currents) [25 Hrs]

1. Physical Principles of Thermal energy: Specific heat, Modes of heat transfer, Effects, contraindications, precautions & adverse effects of Thermotherapy

2. Electro Magnetic Spectrum.

3. SWD: Define short wave, Frequency & Wavelength of SWD, Principle of Production of SWD, Circuit diagram &: Production of SWD. Methods of Heat Production by SWD treatment. Types of SWD Electrode, Placement & Spacing of Electrodes, Tuning- Testing of SWD Apparatus, Physiological & Therapeutic effects, Indications & Contraindications, Dangers, Dosage parameters.

4. Pulsed Electro Magnetic Energy: Principles, Production & Parameters of PEME. Uses of PEME.

5. Micro Wave Diathermy: Define Microwave, Wavelength & Frequency, Production of MW Applicators, Dosage Parameters. Physiological Therapeutic effects. Indications & Contraindications. Dangers of MWD.

6. Ultrasound: Define Ultrasound. Frequency, Piezo Electric effects: Direct. Reverse, Production of US, Treatment Dosage Parameters: Continuous & Pulsed mode intensity. US Fields: Near Field- Far Field Half Value distance. Attenuation, Coupling Media Thermal Effects. Non-thermal effects. Principles - Application of US: Direct contact. Water bag, Water bath. Solid sterile gel pack method for wound. Uses of US, Indications & Contraindications. Dangers of Ultrasound. Phonophoresis: Define Phonophoresis, Methods of application, Commonly used drugs. Uses. Dosages of US.

7. IRR: Define IRR, wavelength & parameters Types of IR generators, Production of IR, Physiological & Therapeutic effects, Duration frequency of treatment. Indication & Contraindications

8. UVR: Define UVR- Types of UVR, UVR generators: Types of lamps, Therakatin tunnel. Psoralen Photochemotherapy, Mechanism of action, PUVA apparatus, PUVA regimen. Physiological & Therapeutic Effects.

9. LASER: Define LASER. Types of LASER . Principles of Production. Production of LASER by various methods. Methods of application of LASER. Dosage of LASER. Physiological & Therapeutic effects of LASER. Safety precautions of LASER. Classifications of LASER. Energy density & power density.

Section IV - Superficial heating Modalities. [15 Hrs]

1. Wax Therapy: Principle of Wax Therapy application - latent Heat. Composition of Wax Bath Therapy unit Methods of application of Wax, Physiological & Therapeutic effects Indications & Contraindications. Dangers.

2. Contrast Bath: Methods of application. Therapeutic uses, Indications & Contraindications.

3. Moist Heat Therapy: Hydro collator packs - in brief, Methods of applications. Therapeutic: uses. Indications & Contraindications.

4. Fluidotherapy: Construction, Method of application. Therapeutic uses, Indications & Contraindications

5. Whirl Pool Bath: Construction Method of Application, Therapeutic Uses. Indications & Contraindications.

6. Magnetic Stimulation. Principles Therapeutic uses. Indications & contraindications.

7. Cryotherapy: Define Cryotherapy. Principle- Latent heat of fusion. Physiological Therapeutic effects, Techniques of Applications, Indications Contraindications & Dangers. Methods of application with dosages.

Section V (5 Hours)

1. Prescription and Criteria of selection of modalities

PRACTICAL [200 Hrs]

The student of Electrotherapy must be able to demonstrate the use of electrotherapy modalities applying the principles of electrotherapy with proper techniques for various parts of the body. Develop rationale for choice of modalities, method of application, dosage and progression parameters and safety precautions.

1. Demonstrate the technique for patient evaluation - receiving the patient and positioning the patient for treatment using electrotherapy.
2. Collection of materials required for treatment using electrotherapy modalities and testing of the apparatus.
3. Demonstrate placement of electrodes; for various electrotherapy modalities
4. Electrical stimulation for the muscles supplied by the peripheral nerves
5. Faradism under Pressure for UL and LL
6. Plotting of SD curve with chronaxie and rheobase.
7. Demonstrate FG test
8. Application of Ultrasound for different regions and various methods of application
9. Demonstrate treatment techniques using SWD. IRR and Microwave diathermy
10. Demonstrate treatment method using IFT for various regions
11. Calculation of dosage and technique of application of LASER
12. Technique of application of Hydrocollator packs, cryotherapy, contrast bath, Wax therapy
13. Demonstrate the treatment method using Whirl pool bath
14. Winding up procedure after any electrotherapy treatment method.
15. Demonstration of methods for basic maintenance and repair of all Electrotherapy Equipments.

EXERCISE THERAPY

Course Description

In this course, the student will learn the principles and effects of exercise as a therapeutic modality and will learn the independent prescription of exercises for restoration maintenance and enhancement of physical function among healthy individuals, among diseased and disabled, across various age groups be it individual, group or mass prescription of therapeutic and fitness exercises.

Subject Title	:	EXERCISE THERAPY
Duration	:	13-24 Months
Total hours	:	320
Theory	:	120 hrs
Practical	:	200 hrs
Hours/week	:	8 hrs./week
Method of Assessment	:	Written, Oral, Practical

THEORY

1. Mechanical Principles: [3 Hrs]

Force, Mechanics of Positions – gravity, COG, LOG, base, equilibrium, fixation, stabilization. **Mechanics of movement** – axis, plane, speed, velocity, work, energy, power, acceleration, momentum, inertia, friction.

Simple machines, Pendulums & Elasticity – levers, pulleys, elasticity

2. Introduction to Exercise Therapy [7 Hrs]

History and evolution of Exercise therapy

The aims of exercise therapy

The techniques of exercise therapy

Approach to patients problems

Assessment of patient's condition

Measurements of vital parameters

Starting positions- Fundamental positions & derived positions

Planning of treatment

3. Methods of testing [10 Hrs]

a) Functional tests

b) Measurement of joint range: ROM-Definition. Normal ROM for all peripheral joints & spine, Goniometer-parts, types, principles, uses measurements of ROM for all peripheral joints

c) Test for neuromuscular deficiency

* Manual muscle testing: introduction to MMT principles and aims. Indications and limitation. Techniques of MMT for group and individual muscles: techniques of MMT for upper limb/techniques of MMT for lower limb, techniques of MMT for spine

* Anthropometric measurements: Muscle girth- biceps, triceps, forearm, quadriceps, calf

* Static Power Test

* Dynamic power test

* Endurance test

* Speed test

d) Test for co-ordination

e) Tests for sensations

f) Pulmonary function tests

g) Measurement of Limb Length: True limb length, apparent limb length, segmental limb length.

h) Measurement of the angle of pelvic inclination

4. Relaxation [5 Hrs]

Definitions: Muscle tone, postural tone, voluntary movement, degrees of relaxations, pathological tension in muscle, stress mechanics, types of stresses, effect of stress on the body mechanism, Indications of Relaxations, methods and techniques of relaxation-principles and uses, General, local, Jacobson's, Mitchell's. Traditional Indian methods of Meditation as per Yoga.

5. Passive movements[5 Hrs]

Causes of immobility, classification of passive movements, specific definitions related to passive movements, Principles of giving passive movements, Indications, contraindications, effects of uses, techniques of giving passive movements. Dosage and progression of Passive movements

6. Active movements [13 Hrs]

Definition of strength, power and work, endurance, muscle actions.

Physiology of muscle performance: structure of skeletal muscle, chemical & mechanical events during contraction and relaxation, muscle fiber type, motor unit, force gradation.

Causes of decreased muscle performance

Physiologic adaptations to training: strength and power, endurance

Facilitation and Inhibition Techniques

Types of active movements

Free exercise: Classification, principles, techniques, indications, contraindications, effects and uses.

Active assisted exercise: principles, techniques, indications, contraindications, effects and uses.

Assisted-resisted exercise: principles, techniques, indications, contraindications, effects and uses.

Resisted exercise: Definition, principles, indication, contra indications, precaution and techniques, effect and uses.

Graded re-education technique on different groups of muscle

Types of resisted exercise: Manual and mechanical resistance exercise, isometric exercise, Dynamic exercise: concentric and eccentric dynamic exercise: constant versus variable resistance, isokinetic exercise, open-chain and closed-chain exercises. Delayed onset muscle soreness.

Breathing Exercises: definition, types, indications & contraindications

Forced Expiratory Techniques

Postural Drainage: Types, Positions, indications, contraindications, modifications & manual techniques

Specific exercise Regimens: Isotonic- de Lormes, oxford, Macqueen, circuit weight training, Isometric: BRIME (Brief Resisted Isometric Exercise), Multiple ankle isometric. Isokinetic regimens, Repetition maximum (RM) method, Delorme & Watkins, Macqueen Zinovieff (oxford technique), Plyometric Exercises, Concepts of Mckenzie exercise protocol.

7. Proprioceptive Neuromuscular Facilitation [9 Hrs]

Definitions and goals

Basic neurophysiologic principles of PNF: Muscular activity, diagonal patterns of movement: upper limb lower limb

Procedure: components of PNF

Techniques of facilitation

Mobility: contract relax, hold relax, rhythmic initiation.

Strengthening: Slow reversals, repeated contractions, timing for emphasis, rhythmic stabilization.

Stability: Alternating isometric, rhythmic stabilization.

Skill: timing for emphasis, resisted progression Endurance: slow reversals, agonist reversal

8. Suspension Therapy [5 Hrs]

Definition, principles, equipments & accessories, Indications & contraindications, Benefits of suspension therapy

Types of suspension therapy: axial, vertical, pendular. Techniques of suspension therapy for upper limb

Techniques of suspension therapy for lower limb

9. Functional Re-education [8 Hrs]

Lying to sitting: Activities on the Mat/Bed, Movement and stability at floor level; Sitting activities and gait; Lowerlimb and Upperlimb activities.

10. Aerobic Exercise [5 Hrs]

Definition and key terms; Physiological response to aerobic exercise, Examination and evaluation of aerobic capacity - Exercise Testing, Determinants of an Exercise Program.

The Exercise Program, Normal and abnormal response to acute aerobic exercise, Physiological changes that occur with training, Application of Principles of an Aerobic conditioning program for patients - types and phases of aerobic training.

11. Stretching [8 Hrs]

Definition of terms related to stretching; Tissue response towards immobilization and elongation, Determinants of stretching exercise. Effects of stretching, inhibition and

relaxation procedures. Precautions and contraindications of stretching, Techniques
Dosage and progression of stretching. Facilitated stretching

12. Manual Therapy, Soft tissue & Neural tissue Mobilization and Massage [10 Hrs]

Definition of Schools of Manual Therapy, Principles, Grades, Indications and
Contraindications, Effects and Uses - Maitland, Kaltenborn, Mulligan

Biomechanical basis for mobilization, Effects of joint mobilization. Indications and
contraindications, Principles of mobilization.

Barrier Concept, Movement Diagrams, Grades of mobilization, Techniques of
mobilization for upper limb, lower limb. Precautions.

Introduction to Muscle Energy Technique.

Basics of Neurodynamics, Nerve tension testing & Neural tissue Mobilization

Basics of Myofascial Release & Trigger Point Release: Indications, Contraindications,
Precautions & Protocol

History and Classification of Massage Technique Principles, Indications and
Contraindications Technique of Massage Manipulations Physiological and Therapeutic
Uses of Specific manipulations

13. Traction (3 Hours) – Definition, Principles, Types, Methods of application. Therapeutic uses, Indications & Contraindications.

14. Balance [3 Hrs]

Definition, Physiology of balance: contributions of sensory systems, processing
sensory information, generating motor output Components of balance (sensory,
musculoskeletal, biomechanical) Causes of impaired balance, Examination & evaluation
of impaired balance. Activities or treating impaired balance: mode, posture,
movement, Precautions & contraindications, Types Balance retraining.

15. Co-ordination Exercise [3 Hrs]

Anatomy & Physiology of cerebellum with its pathways Definitions: Co-ordination, Inco-ordination Causes for Inco-ordination, Test for co-ordination: equilibrium test, non equilibrium test Principles of co-ordination exercise Frenkel's Exercise, Tai Chi etc progression, home exercise.

16. Posture [2 Hrs]

Definition, Active and Inactive Postures, Postural Mechanism, Patterns of Posture, Kendall's System of Postural Assessment, Principles of re-education: corrective methods and techniques. Patient education.

17. Walking Aids [5 Hrs]

Types, Measurements, Prescription, Training & Evaluation: Crutches, Canes, Frames

18. Hydrotherapy [5 Hrs]

Definitions, Goals and indications. Precautions and Contraindications, Properties of water. Use of special equipments, techniques. Effects and uses, merits and demerits. Limitations and scope of practice.

19. Individual and Group Exercises[3 Hrs]

Advantages and Disadvantages, Organisation of Group exercises. Recreational Activities and Sports for groups and mass gathering.

20. Introduction to Yoga [8 Hrs]

Philosophy of Yoga, Use of Yoga in Medical care and Physiotherapy,

Asanas - Classification Principles methods and Techniques,

Pranayamas – Classification Principles. Methods and Techniques

Meditation - Classification Principles. Methods and Techniques

PRACTICALS [200 Hrs]

The students of exercise therapy are to be trained in Practical Laboratory work for all the topics discussed in theory. The student must understand how to evaluate and apply

judiciously the different methods of exercise therapy techniques on the Patients. They must be able to;

1. Demonstrate the technique of measuring using goniometry
2. Demonstrate muscle strength using the principles and technique of MMT
3. Demonstrate – Basic Asana, Pranayama and Meditation methods
4. Demonstrate the PNF techniques
5. Demonstrate exercises for training co-ordination – Frenkel's exercises
6. Demonstrate the techniques of massage and Soft Tissue manipulations
7. Demonstrate technique for functional re-education
8. Assess and train for using walking aids
9. Demonstrate mobilization of individual joint regions
10. Demonstrate to use the technique of suspension therapy for mobilizing and strengthening joints and muscles
11. Demonstrate the techniques for muscle stretching
12. Assess and evaluate posture and gait
13. Demonstrate to apply the technique of passive movements
14. Demonstrate various techniques of active movements
15. Demonstrate techniques of strengthening muscles using resisted exercises
16. Demonstrate techniques for measuring limb length and body circumference

Desirable –

Individual and group exercises in Hydrotherapy Pool.

PHARMACOLOGY

Course Description

This course introduces the student to basic pharmacology of common drugs used, their importance in the overall treatment including Physiotherapy. The student after completing the course will be able to understand the general principles of drug action and the handling of drugs by the body. The student will be aware of the contribution of both drug and Physiotherapy factors in the outcome of treatment.

Subject title	PHARMACOLOGY
Duration	13 - 24 Months
Total Hours	80
Theory	80 Hrs
Total Hours/week	2 Hrs

NOTE – paper setters must restrict Essay questions to the General Pharmacology and other questions also must have relevance to Physiotherapy practice.

THEORY

1. General Principles of Pharmacology (8 Hrs)

Basic Principles of Pharmacology

Pharmacokinetics I: Drug Administration, Absorption, and Distribution

Pharmacokinetics II: Drug Elimination

Drug Receptors

2. Pharmacology of the Central Nervous System (13Hrs)

General Principles of Central Nervous System Pharmacology

Sedative-Hypnotic and Antianxiety Agents

Drugs Used to Treat Affective Disorders: Depression and Bipolar Syndrome

Antipsychotic Drugs

Antiepileptic Drugs

Pharmacological Management of Parkinson Disease

General Anesthetics

Local Anesthetics

3. Drugs Affecting Skeletal Muscle (5 Hrs)

Skeletal Muscle Relaxants

4. Drugs Used to Treat Pain and Inflammation (10 Hrs)

Opioid Analgesics

Non Steroidal Anti-Inflammatory Drugs

Pharmacologic Management of Rheumatoid Arthritis and Osteoarthritis

Patient-Controlled Analgesia

5. Autonomic and Cardiovascular Pharmacology (13 Hrs)

Introduction to Autonomic Pharmacology

Cholinergic Drugs

Adrenergic Drugs

Antihypertensive Drugs

Treatment of Angina Pectoris

Treatment of Cardiac Arrhythmias

Treatment of Congestive Heart Failure

Treatment of Coagulation Disorders and Hyperlipidemia

6. Respiratory and Gastrointestinal Pharmacology (10 Hrs)

Respiratory Drugs

Gastrointestinal Drugs

7. Endocrine Pharmacology (3 Hrs)

Introduction to Endocrine Pharmacology

Adrenocorticosteroids

Male and Female Hormones

Thyroid and Parathyroid Drugs: Agents Affecting Bone Mineralization

Pancreatic Hormones and the Treatment of Diabetes Mellitus

8. Chemotherapy of Infectious and Neoplastic Diseases (8 Hrs)

Treatment of Infections I: Antibacterial Drugs

Treatment of Infections II: Antiviral Drugs

Treatment of Infections III: Antifungal and Antiparasitic Drugs

Cancer Chemotherapy

Immunomodulating Agents

Complementary and Alternative Medications

9. Drugs Administered by Iontophoresis and Phonophoresis (5 Hrs)

10. Drugs of Abuse in Sports (5 Hrs)

MICROBIOLOGY

Course Description

This subject follows the basics of anatomy, physiology and biochemistry and it forms a vital link between preclinical subjects and clinical subjects. Microbiology involves the study of common organisms causing diseases including nosocomial infections and precautionary measures to protect one from acquiring infections. The knowledge and understanding of microbiology is essential to institute appropriate treatment or suggest preventive measures to the patient.

NOTE – paper setters must restrict Essay questions to the General Microbiology and other questions also must have relevance to Physiotherapy practice.

Subject Title	MICROBIOLOGY
Duration	13-24 Months
Total Hours	80 Hrs
Theory	80 Hrs
Total Hours/week	2 Hrs

THEORY

1. General Microbiology [10 Hrs]

Definitions: infections, parasite, host, vector, fomite, contagious disease, infectious disease, epidemic, endemic, pandemic, Zoonosis, Epizootic, Attack rate.

Normal flora of the human body.

Routes of infection and spread endogenous and exogenous infections source at reservoir of infections.

Bacterial cell Morphology limited to recognizing bacteria in clinical samples Shape, motility and arrangement. Structures, which are virulence, associated

Essentials of bacterial growth requirements.

Sterilization, disinfection and universal precautions in relation to patient care and disease prevention.

Definition of asepsis, sterilization, disinfection. Antimicrobials: Mode of action, interpretation of susceptibility tests, resistance spectrum of activity.

2. Immunology [5 Hrs]

Basic principles of immunity immunobiology : lymphoid organs and tissue Antigen, Antibodies, antigen and antibody reactions with relevance to pathogenesis and serological diagnosis. Humoral immunity and its role in immunity Cell mediated immunity and its role in immunity.

3. Bacteriology [15 Hrs]

To be considered under the following headings

Morphology, classification according to pathogenicity, mode of transmission, methods of prevention, transport of samples, interpretation of laboratory reports

Staphylococci. Streptococci and Pneumococci,

Mycobacteria: Tuberculosis. M.leprae. atypical mycobacteria, Enterobacteriaceae

V. cholerae

4. General Virology [10 hrs]

General properties: basic structure and board classification of viruses

Immunity and prophylaxis of viral diseases. Commonly used antiviral agents.

5. Mycology: [5 Hrs]

General properties of fungi. Classification based or disease: superficial, subcutaneous, deep mycoses opportunistic infections including Mycotoxins, systemic mycoses. General principles of fungal diagnosis, Antifungal agents.

6. Clinical/Applied Microbiology [20 Hrs]

Streptococcal infections: Rheumatic fever and Rheumatic heart disease. Meningitis.
Tuberculosis, Pyrexia of unknown origin, leprosy. Sexually transmitted diseases.
Poliomyelitis.

Hepatitis, Acute-respiratory infections.

Central nervous System infection

Urinary tract infections. Wound infection.

Opportunistic infections,

HIV infection.

Malaria,

Filariasis,

Zoonotic diseases.

Laboratory Works only: [15 Hrs]

1. Observation and study of common culture media
2. Observation and study of some clinically important bacteria – Staphylococcus, Streptococcus, E.coli , Mycobacterium
3. Observation of equipments and procedures used for sterilization and disinfection
4. Demonstration of stain Gram staining KOH preparation Acid Fast staining

PATHOLOGY

Course Description

This subject follows the basic subjects of Anatomy, Physiology and Biochemistry and it forms a vital link between preclinical subjects and clinical subjects. Pathology involves the study of causes and mechanisms of diseases. The knowledge and understanding of

pathology is essential to institute appropriate treatment or suggest preventive measures to the patient.

NOTE – paper setters must restrict Essay questions to the pathology and other questions also must have relevance to Physiotherapy practice.

Subject Title	PATHOLOGY
Duration	13-24 Months
Total Hours	80
Theory	80 Hrs
Total Hours/week	2 Hrs

THEORY

General Pathology

1. Introduction to pathology [2 hrs]

History of Pathology as a subject, Relevance to Physiotherapy practice. Prevention of communicable diseases Handling of infected material and health education.

2. Cell injuries : [5 hrs]

Reversible and Irreversible cell injuries: Types, sequential changes, cellular swellings, Types of necrosis and gangrene. Autolysis. Pathological calcification: Dystrophic and metastatic, intra cellular accumulations.

3. Inflammation and repair: [5 Hrs]

Acute inflammation: Features, causes, vascular & cellular events. Inflammatory cells and mediators. Chronic inflammation: Causes, types, classification non specific and granulomatous with examples. Repair wound healing by primary and secondary unions,

factors promoting and delaying the process. Healing in specific site including bone healing. Effect of Physiotherapy Modalities on repair of tissues.

4. Immunopathology: [5 Hrs]

Immune system; General concepts. Hypersensitivity: type and examples, antibody and cell mediated tissue injury with examples. Secondary immune deficiency including HIV infection auto immune disorder: Basic concepts and classification, SLE. AIDS – etiology, modes of transmission, diagnostic procedures,

5. Infectious disease: [5 Hrs]

Mycobacterial diseases: Tuberculosis, leprosy and syphilis. Bacterial disease: Pyogenic, diphtheria, gram negative infection, bacillary dysentery. Viral diseases: poliomyelitis, herpes, rabies, measles, HIV infection. Fungal disease and parasitic diseases: Malaria, filaria, amoebiasis.

6. Circulatory disturbances: [5 hrs]

Hyperaemia/Ischemia and haemorrhage, Oedema: Pathogenesis and types. Chronic venous congestion: Lung, liver, spleen. Systemic pathology thrombosis and embolism; Formation fate and defects. Infarction; Types, common sites. Shock: Pathogenesis, types.

7. Growth disturbances and neoplasia: [5 Hrs]

Neoplasia: Definition, classification, biological behavioral benign and malignant, carcinoma and sarcoma. Malignant neoplasia: Grades and stages, local and distant spread. Carcinogenesis: Environmental carcinogens, chemical, viral, occupational, heredity and cellular oncogens and prevention of cancer. Benign and malignant tumors

8. Urinary system: [2 Hrs]

Glomerular nephritis, Nephrotic Syndrome, Urinary tract infection, Renal calculi, Renal carcinomas

9. Nutritional disorders: [2 Hrs]

Protein energy malnutrition: Marasmus, kwashiorkor, and vitamin deficiency disorders, Obesity. Bulimia.

10. Genetic disorders: [2 Hrs]

Basic concepts of genetic disorders and some common examples and congenital malformation and Hemophilia.

11. Hematology: [5 Hrs]

Constituents of blood & bone marrow. Regulation of Hemopoiesis

Anemia: Classification, clinical features & lab diagnosis.

Thalassemia, Spherocytosis and Enzyme deficiencies.

Leukocytic disorders: Leukocytosis, Leukopenia, Leukemoid reaction.

Leukemia: Blood transfusion; Grouping and cross matching, untoward reactions, transmissible infections including HIV & hepatitis.

12. Respiratory System [5 Hrs]

Pneumonia, Bronchitis, Bronchiectasis, Asthma, Tuberculosis, Carcinoma of lungs, Occupational lung diseases and their effect on Physical activity.

13. Cardiovascular Pathology [5 hrs]

Congenital Heart disease: Atrial septal defect, Ventricular septal defect, Fallot's tetralogy. Patent ductus arteriosus. Endocarditis. Rheumatic Heart disease. Vascular diseases: Atherosclerosis, Aneurysm and Arteritis and tumours of Blood vessels. Ischemic heart Disease: Myocardial infarction. Hypertension and hypertensive heart Disease.

14. Alimentary tract [2 Hrs]

Oral Pathology: Ulcers, Carcinoma, Esophagus inflammatory,

Stomach and Intestine: Gastritis, Ulcer & Tumours.

15. Hepato-biliary pathology [1 Hrs]

Jaundice: Types, aetio-pathogenesis and diagnosis. Hepatitis: Acute, Chronic, neonatal.
Alcoholic liver disease common clinical conditions

16. Lymphatic System [2 Hrs]

Lymphadenitis Causes of Lymph Node enlargements common clinical conditions

17. Musculoskeletal System [8 Hrs]

Arthritis: Suppurative, Rheumatoid. Osteoarthritis, Gout, Tuberculous.
Heamarthropathies Diseases of Muscles.

Osteomyelitis, Metabolic diseases: Rickets/Osteomalacia, osteoporosis,
Hyperparathyroidism, Paget's disease.

Tumours Classification: Benign, Malignant, Metastatic and synovial sarcoma.

18. Endocrine pathology [2 Hrs]

Diabetes Mellitus: Types, Pathogenesis, Pathology, Non-neoplastic and Neoplastic
lesions of Thyroid

19. Neuropathology: [5 Hrs]

Inflammations and Infections: TB Meningitis, Pyogenic Meningitis, viral meningitis, Brain
Abscess. CNS Tumors Vascular lesions of CNS

Poliomyelitis Perpheral neuropathies including Diabetic neuropathies,

Parkinsonism Dementia - Alzheimer's disease

Disorders of spinal cord – SCD, Trauma, Syringomyelia, Tabes dorsalis

20. Dermatopathology [2 Hrs]

Common clinical conditions

Practical [5 Hours]

Demonstration of relevant slides and demonstration of the Lab evidences of common Neuro Musculoskeletal and Cardio Vascular and pulmonary Diseases.

MEDICAL INSTRUMENTATION

Course Description

The Subject is designed to provide the history of Electrotherapy modalities and an overview in the basics of the Medical equipments that are seen by the students in their clinical practice. The student is to be able to understand the mechanism of Physiotherapeutic instruments and its repair Calibration and Maintenance.

Subject Title	: MEDICAL INSTRUMENTATION
Duration	: 13-24 Months
Total Hours	: 80
Theory	: 60 Hours
Practical	: 20 Hours
Total Hours / Week	: 2 Hour/ Week

Theory (60 Hrs)

- 1. Micro & Macro shock, source of shock, monitoring & interrupting circuit from shock**
- 2. Calibration**

3. Maintenance of equipments – Preventive maintenance, break down maintenance
4. Short wave diathermy
5. Muscle and nerve stimulator
6. IR and UV Rays
7. Stimulators including FES
8. Lasers
9. Ultrasound Conventional and Combination varieties
10. ECG EMG and EEG Equipment & Technique
11. Pacemakers, Defibrillators, Ventilators
12. Common machines in ICU

Practical Demonstration of various parts and working of all instruments [20 Hrs]

COMPUTER SCIENCE

Course Description

At the completion of this course the student will have a basic knowledge about computers and how to deal with different types of programmes, and how to use Computers in education and clinical practice.

Subject Title	:	Computer Science
Duration	:	13-24 Months
Total Hours	:	80
Theory	:	40 Hours
Practical	:	40 Hours

Total Hours/week : 2 Hr

I. [2Hrs]

1. History of computers
2. Type of computer Generation
3. Digital computer Organization
4. Binary number System

II [8 Hrs]

- i. Database Management System concepts
- ii. Introduction to computer programming and application software
- iii. Computer Networks
 - a. LAN
 - b. WAN
 - c. MAN
 - d. Internet Concept

III [10 Hrs]

1. Current Operating systems
2. Application Software MS OFFICE 2000 (MS WORD, EXCEL, MS POWERPOINT)

IV [20 Hrs]

1. Application of computers in Health Education Training and Administration.
2. Application to various aspects of Physiotherapy Practice – Biofeedback, Simulations and virtual reality etc.

V. Practical [40 Hrs]

Use of computers to search relevant study materials from internet, using computers to make reports and for making presentations

THIRD YEAR BPT

GENERAL MEDICINE & GENERAL SURGERY

Subject Description

This subject follows the basic science subjects to provide the knowledge about relevant aspects of general medicine and surgery. The student will have a general understanding of the diseases and surgeries that the therapist would encounter in their practice. The objective of this course is that after 120 hrs of lectures and discussion the student will be able to list the etiology, pathology, clinical features and treatment methods for various medical conditions and shall be able to enlist the indications for surgery, etiology, clinical features and surgical methods for various conditions.

Subject Title: General Medicine & Surgery

Duration: 25 – 36 Months

Total Hours: 80

Theory / Lecture: 2 Hours / Week

Method of Assessment: Written

GENERAL MEDICINE

1. Infection: Effects of Infection on the body –source and spread of infection – vaccinations – generalized infections – rashes and infection – food poisoning and gastroenteritis – sexually transmitted diseases [4 Hours]

2. Food and Nutrition : Assessment – Nutritional and Energy requirements; Deficiency diseases – clinical features and treatment; Protein – Energy Malnutrition : Clinical features and treatment; Obesity and its related disorders : Causes – Complications – benefits of weight loss – management of Obesity – diet, exercise and medications.[5 Hours]

3. Endocrine diseases: Common presenting symptoms of Endocrine disease – common classical disease presentations, clinical features and its management; Diabetes Mellitus : Etiology and pathogenesis of diabetes – clinical manifestations of the disease – management of the disease – Complications of diabetes. [5 Hours]

4. Diseases of the blood : Examinations of blood disorders – Clinical manifestations of blood disease; Anemia – signs and symptoms – types and management ; Hemophilia - Cause – clinical features severity of disease – management – complications due to repeated haemorrhages – complications due to therapy. [5 Hours]

6. Diseases of the digestive system: Clinical manifestations of gastrointestinal disease – Aetiology, clinical features, diagnosis, complications and treatment of common conditions. Infections of Alimentary Tract ; Clinical manifestations of liver diseases - Aetiology, clinical features, diagnosis, complications and treatment of the common conditions [4 Hours]

7. Diseases of the Skin: Examination and clinical manifestations of skin diseases; Causes, clinical features and management of the following skin conditions: Leprosy, Psoriasis, Vasomotor disorders, Dermatitis, Coccal and Fungal Parasitic and Viral infections. [5 Hours]

8. Pediatrics: Problems and management of LBW infants, Perinatal problems and management, Congenital abnormalities and management, Respiratory conditions of childhood, Cerebral Palsy – causes, complications, clinical manifestations, treatment ; Spina Bifida – management and treatment, Epilepsies – types, diagnosis and treatment; Recognizing developmental delay, common causes of delay ; Orthopedic and Neuromuscular disorders in childhood, clinical features and management ; Sensory disorders – problems resulting from loss of vision and hearing ; Learning and behavioural

problems – Hyperactivity, Autism, Challenging behaviours, Educational delay, The Clumsy Child. [10 Hours]

9. Psychiatric Disorders: Classifications, Causes, Clinical manifestations and treatment methods used in Psychiatry. [2 Hours]

GENERAL SURGERY

1. Introduction to surgery: Fluid, Electrolyte and Acid-Base disturbances – diagnosis and management; Nutrition in the surgical patient; Scars – types and treatment. Hemostasis – components, hemostatic disorders, factors affecting bleeding during surgery. Transfusion therapy in surgery – blood components, complications of transfusion ; Surgical Infections ; General Post – Operative Complications and its management [5 Hours]

Reasons for Surgery; Types of anaesthesia and its effects on the patient; Types of Incisions; Clips Ligatures and Sutures; General Thoracic Procedures – Radiologic Diagnostic procedures, Endoscopy – types, Biopsy – uses and types. Overview and Drainage systems and tubes used in Surgery. [3 Hours]

2. Surgical Oncology: Cancer – definition, types, clinical manifestations of cancer, Staging of Cancer, surgical procedures involved in the management of cancer. [3 Hours]

3. Diseases of the Arteries and Veins: Definition, Etiology, Clinical features, signs and symptoms, complications, management and treatment of following diseases: Arteriosclerosis, Atherosclerosis, Aneurysm, Buerger’s disease, Raynaud’s Disease, Thrombophlebitis, Deep Vein Thrombosis, Pulmonary Embolism, Varicose Veins. [5 Hours]

4. Abdominal surgery: Definition, Indication, Incision, Physiological changes and Complications following Common operations like Cholecystectomy, Colostomy, Ileostomy, Gastrectomy, Hernias, Appendicectomy Mastectomy, Nephrectomy, Prostatectomy. [5 Hours]

5. Burn: Definition, Classification, Causes, Prevention, Pathological changes, Complications, Clinical Features and Management. Skin Grafts – Types, Grafting Procedures, Survival of Skin Graft ; Flaps – Types and uses of Flaps. [5 Hours]

6. Women's Health: Menstrual cycle and its disorders. Hormonal disorders of females- obesity and female hormones. Cancer of the female reproductive organs management. Infections and sexually transmitted disease in female Menopause - its effects on emotions and musculoskeletal system. Malnutrition and deficiencies in females. Maternal physiology in pregnancy. Musculo skeletal disorders during pregnancy. Prenatal complications-investigations- management. Child birth- Stages complications- investigations-management – Pain relief in labour - Puerperium - Post Natal care. Surgical procedures involving child birth. Incontinence – Types, Causes, Assessment and Management. Definition, Indications and Management of the following surgical procedures – Hysterosalphyngography, Dilatation and Curettage, Laproscopy, Colposcopy, Hysterectomy. [10 Hours]

7. ENT: Common problems of ear, otitis media, Otosclerosis, functional achonia and deafness, management facial palsy classification, medical and surgical management of lower motor neuron type of facial palsy. [2 Hours]

8. Ophthalmology: Ophthalmologic surgical conditions, refraction's, conjunctivitis, glaucoma, corneal ulcer, iritis, cataract, retinitis, detachment of retina, defects of extra-ocular muscles surgical management [2 Hours]

सर्वे भवन्तु सुखिनः



PHYSIOTHERAPY IN GENERAL MEDICINE AND SURGERY

Subject Description

The subject is designed to provide knowledge in assessing and planning Physiotherapy interventions for various General, Medical and Surgical conditions. The student must be able to reassess the patient as necessary, to monitor the patient in regard to treatment, to monitor the patient's vital signs, and to provide appropriate Interventions to the patient considering current evidence based guidelines. .

Subject Title: Physiotherapy in General Medicine & Surgery

Duration: 25 – 36 Months

Total Hours: 120 Hrs

Theory: 80 Hours

Practical: 160 Hours

Total Hours / Week: 6 Hrs

Lecture: 3 Hours / Week

Practical: 3 Hours / Week

Method of Assessment: Written, Oral, Practical

1. Management of wound ulcers- Care of ulcers and wounds - Care of surgical scars using electro therapeutics for healing of wounds, prevention of Hyper granulated Scars Keloids, Electrotherapeutics measures for relief of pain during mobilization of scars tissues. **[7 Hours]**

2. Physiotherapy in dermatology - Documentation of assessment, treatment and follow up skin conditions. U.V.R therapy in various skin conditions; Vitiligo; Hair loss; Pigmentation; Infected wounds ulcers. Faradic foot bath for Hyperhydrosis. Massage maneuvers for cosmetic purpose of skin Care of anesthetic hand and foot; **(4 Hours)**

- 3. Leprosy:** Evaluation, planning and management of leprosy-prescription, fitting and training of devices and prevention of disability **[4 Hours]**
- 5. Burns management:** Role of Physiotherapy in the management of burns, post grafted cases - Mobilization and Musculo-skeletal restorative exercises following burns **[5 Hours]**
- 5. PVD:** Physiotherapy management following PVD **[4 Hours]**
- 6. Abdominal Surgeries:** Management of Pulmonary Restorative function following surgical procedures on Abdomen and Thorax **[6 Hours]**
- 7. Amputations:** Management of Amputations following Diabetes, PVD - Prosthesis in amputations of lower limbs following ulcers and gangrenes **[6 Hours]**
- 8. Oncology:** Physiotherapy intervention in the management of Medical, Surgical and Radiation Oncology Cases **[5 Hours]**
- 9. Physiotherapy for Plastic surgery and Organ transplantations [4 Hrs]**
- 10. Home program and education of family members in patient care [2 Hours]**
- 11. Physiotherapy in Obstetrics:** Physiotherapy in pregnancy. Electrotherapy and Exercise Therapy measures for the Women's health issues **[8 Hours]**
- 12. Treatment, Response to exercise and Implications of Physiotherapy in the following disease conditions:** Hypertension, Diabetes, Renal Failure and Obesity. **[6 Hours]**
- 13. .Health Fitness and Promotion:** Fitness Evaluation, Analysis of Body composition, Evaluation and prescription of Exercise, Factors affecting exercise Performance, Exercise Prescription for Specific groups: Elderly, Women and Children. **[8 Hours]**
- 14. Geriatrics:** Role of P.T in management of age related diseases and disorders such as – Osteoporosis, Dementia, Fall prevention and fitness programmes. **[7 Hours]**
- 15. Outcome measurement in General surgical and medical Physiotherapy care [4 Hrs]**

Practical: 160 Hours

Practical shall be conducted for all the relevant topics discussed in theory in the following forms:

1. Bedside case presentations and case discussions in the wards
2. Demonstration of application of general physiotherapeutic techniques on patients
3. Participation under faculty guidance in management.
4. Lab sessions consisting of evaluation and assessment methods on student models, treatment techniques and practice sessions.

CARDIO-RESPIRATORY DISORDERS AND SURGERY

Subject Description

This subject follows the basic science subjects to provide the knowledge about relevant aspects about cardio-respiratory disorders and surgery. The student will have a general understanding of the diseases that the therapist would encounter in their practice. The objective of the course is that after specified hours of lectures and discussion the student will be able to list the aetiology, pathology, clinical features and treatment methods for various cardio-respiratory conditions.

Subject Title: CARDIO-RESPIRATORY DISORDERS & SURGERY

Duration: 25 – 36 Months

Total Hours: 80

Theory: 80 Hours

Total Hours / Week: 2Hours

Method of Assessment: Written

Theory:

1. Cardiovascular Diseases: Examination of the Cardiovascular System – Investigations : ECG, Exercise Stress Testing, Radiology ; Clinical manifestations of Cardiovascular disease

; Definition, Aetiology, Clinical features, signs and symptoms, complications, management and treatment of following diseases and disorders of the heart : Pericarditis, Myocarditis, Endocarditis, Rheumatic Fever – resulting in valve disorders, Mitral Stenosis & Insufficiency, Aortic Stenosis and Insufficiency, Cardiac tumors. **[10 Hours]**

Ischemic Heart Disease, Coronary Valve Disease, Congenital Heart diseases – Acyanotic congenital heart disease & Cyanotic congenital heart disease : Patent Ductus Arteriosus, Coarctation of Aorta, Atrial Septal Defect, Ventricular Septal Defect, Tetralogy of Fallot, Transposition of Great Vessels, Cardiac Arrest ; Examination and Investigations of diseases of arteries and veins ; Hypertension : Definition, causes, classification, types, assessment, investigations and management. **[10 Hours]**

2. Respiratory Diseases: Examination of the Respiratory System –Investigations: Chest Radiographs, Pulmonary Function Testing, Arterial Blood Gas Analysis ; Clinical manifestations of Lung disease ; Patterns of lung disease – Chronic Obstructive Lung Disease and Restrictive Lung Disease ; Definition, Etiology, Clinical features, signs and symptoms, complications, management and treatment of following lung diseases : Chronic Bronchitis, Emphysema, Asthma, Bronchiectasis, Cystic Fibrosis, Upper Respiratory Tract Infections, Pneumonia, Tuberculosis, Fungal Diseases, Interstitial Lung Diseases, Diseases of the pleura, diaphragm and chest wall, ARDS ; Respiratory failure – Definition, types, causes, clinical features, diagnosis and management. **[10 Hours]**

3. Paediatrics: Respiratory conditions of childhood – causes, complications, clinical manifestations, diagnosis and treatment. **[5 Hours]**

4. Disorders of the Chest Wall, Lung and Mediastinum: Definition, Clinical features, diagnosis and choice of management for the following disorders – chest wall deformities, chest wall tumors, Pleural Effusion, Empyema Thoracis, Lung abscess, Bronchiectasis, Tuberculosis, Bronchogenic Carcinoma, Bronchial Adenomas, Metastatic tumors of the Lung, tracheal Stenosis, Congenital tracheomalacia, Neoplasms of the trachea, Lesions of the Mediastinum. Carcinoma of the female breast. **[10 Hours]**

5. Thoracic Trauma: Causes, Clinical Presentation, Diagnosis and treatment of the following Thoracic Trauma situations – Airway obstruction, Pneumothorax, Hemothorax, Cardiac Tamponade, Tracheobronchial disruption, Aortic disruption, Diaphragmatic disruption, Esophageal disruption, Cardiac and Pulmonary Contusions. **[5 Hours]**

6. Introduction to surgery: Reasons for Surgery; Types of anaesthesia and its effects on the patient; Types of Incisions; Clips Ligatures and Sutures; General Thoracic Procedures – Radiologic Diagnostic procedures, Endoscopy – types, Biopsy – uses and types. Overview and Drainage systems and tubes used in Surgery. **[5 Hours]**

7. Thoracic surgeries: Thoracotomy – Definition, Types of Incisions with emphasis to the site of incision, muscles cut and complications. Lung surgeries: Pneumonectomy, Lobectomy, Segmentectomy – Indications, Physiological changes and Complications; Thoracoplasty, Pleurectomy, Pleurodesis and Decortication of the Lung. Cardiac surgeries – An overview of the Cardio-Pulmonary Bypass Machine – Extracardiac Operations, Closed Heart surgery, Open Heart surgery. Transplant Surgery – Heart, Lung and Kidney – Indications, Physiological changes and Complications. **[10 Hours]**

8. Occupational Lung diseases. [4 Hours]

9. Drug therapy: Drugs to prevent and treat inflammation, Drugs to treat Bronchospasm, Drugs to treat Breathlessness, Drugs to help sputum clearance, Drugs to inhibit coughing, Drugs to improve ventilation, Drugs to reduce pulmonary hypertension, Drug delivery doses, Inhalers and Nebulisers. **[2 Hour]**

10. Intensive and Emergency care: First Aid: Trauma – Accidents: explosions, riots, gunshots, burns, septicaemia, acute respiratory failure, pulmonary embolism/pulmonary oedema, cardiac failure/myocardial infarction, unconsciousness/coma, drug overdose, poisoning, tetanus, respiratory paralysis (Polio/G. B. Syndrome). **[5 Hours]**

11. Cardio Pulmonary Resuscitation and Airway care. [2 Hours]

12. Mechanical ventilators and Medical gas therapy. [2 Hours]

PHYSIOTHERAPY IN CARDIO-RESPIRATORY DISORDERS & INTENSIVE CARE MANAGEMENT

Subject Description

The subject is designed to provide knowledge in assessing and planning Physiotherapy interventions for various cardio-respiratory disorders and surgical conditions. The student must be able to assess the patient as necessary, to monitor the patient's vital signs, to monitor the patient in regard to Physiotherapy treatment, and to independently provide appropriate interventions to the patient considering current evidence based guidelines.

Subject Title: PHYSIOTHERAPY IN CARDIO-RESPIRATORY DISORDERS & INTENSIVE CARE MANAGEMENT

Duration: 25 – 36 Months

Total Hours: 240

Theory: 80 Hours

Practical: 160 Hours

Total Hours / Week: 6

Method of Assessment: Written, Oral, Practical

Theory: 80 Hours

1. Bedside assessment of the patient – Adult & Paediatric [4 Hours]

2. Cardio respiratory investigations and tests – Exercise tolerance Testing – Cardiac & Pulmonary, Radiographs, PFT, ABG, ECG, Haematological and Biochemical Tests [8 Hours]

3. Physiotherapy techniques to increase lung volume – Controlled mobilization, Positioning, Breathing exercise, Neurophysiological Facilitation of Respiration, Mechanical AIDS – Incentive Spirometry, CPAP, IPPB [6 Hours]

4. Physiotherapy techniques to decrease the work of breathing – Measures to optimize the balance between energy supply and demand, positioning, Breathing re-education – Breathing control techniques, Mechanical aids – IPPB, CPAP, BiPAP **[6 Hours]**

5. Physiotherapy techniques to clear secretions – Hydration, Humidification & Nebulisation, Mobilisation and Breathing exercise, Postural Drainage, Manual techniques – Percussion, Vibration and Shaking, Rib Springing, ACBT, Autogenic Drainage, Mechanical aids – PEP, Flutter, IPPB, Facilitation of Cough and Huff, Suctioning **[10 Hours]**

6. Neonatal and Paediatric Physiotherapy – Chest Physiotherapy for children, The neonatal unit, Modifications chest Physiotherapy for specific neonatal disorders, Emergencies in the neonatal unit **[4 Hours]**

7. Physiotherapy in Obstructive lung conditions [5 Hours]

8. Physiotherapy in Restrictive lung conditions [5 Hours]

9. Pulmonary Rehabilitation [4 Hours]

10. Physiotherapy following Lung surgeries [4 Hours]

11. Respiratory failure – Oxygen Therapy and Mechanical Ventilation [4 Hours]

12. Introduction to ICU : ICU monitoring – Apparatus including Mechanical Ventilators, Airways and Tubes used in the ICU, Physiotherapy in the ICU – Common conditions in the ICU – Tetanus, Head Injury, Lung Disease, Pulmonary Oedema, Multiple Organ Failure, Neuromuscular Disease, Smoke Inhalation, Poisoning, Aspiration, Near Drowning, ARDS, Shock; Dealing with emergency situation in the ICU **[6 Hours]**

13. Physiotherapy management following cardiac surgeries [4 Hours]

14. Cardiac Rehabilitation [4 Hours]

15. Home program and education of family members in patient care [2 Hour]

16. Cardio Pulmonary Resuscitation [2 Hours]

17. Applied Yoga in Cardio-respiratory conditions. [2 Hours]

Practical: 160 Hours

Practical shall be conducted for all the relevant topics discussed in theory in the following forms:

1. Bedside case presentations and case discussions in the wards
2. Demonstration of application of cardio-respiratory physiotherapeutic techniques on patients
3. Participation under faculty guidance in management.
4. Lab sessions consisting of evaluation and assessment methods on student models, treatment techniques and practice sessions.

COMMUNITY MEDICINE

Subject Description

This subject follows the basic science subjects to provide the knowledge about conditions the therapist would encounter in their practice in the community. The objective of this course is that after 80 hrs of lectures and discussion the student will be able to demonstrate an understanding of various aspects of health and disease list the methods of health administration, health education and disease preventive measures.

Subject Title: COMMUNITY MEDICINE

Duration: 25 – 36 Months

Total Hours: 80

Theory/ Lecture: 2 Hours / Week

Method of Assessment: Written

1. Health and Disease: Definitions, Concepts, Dimensions and Indicators of Health, Concept of well-being, Spectrum and Determinants of Health, Concept and natural history of Disease, Concepts of disease control and prevention, Modes of Intervention,

Population Medicine, The role of socio-economic and cultural environment in health and disease. [5 hours]

2. Epidemiology: Definition and scope. Principles of Epidemiology and Epidemiological methods: Components and Aims, Basic measurements, Methods, Uses of Epidemiology, Infectious disease epidemiology, Dynamics and modes of disease transmission, Host defenses and Immunizing agents, Hazards of Immunization, Disease prevention and control, Disinfection. Screening for Disease: Concept of screening, Aims and Objectives, Uses and types of screening. [8 hours]

3. Epidemiology of communicable disease: Respiratory infections, Intestinal infections, Arthropodborne infections, Zoonoses, Surface infections, Hospital acquired infections
Epidemiology of chronic non-communicable diseases and conditions: Cardio vascular diseases: Coronary heart disease, Hypertension, Stroke, Rheumatic heart disease, Cancer, Diabetes, Obesity, Blindness, Accidents and Injuries. [8 hours]

4. Public health administration- an overview of the health administration set up at Central and state levels. The national health programme-highlighting the role of social, economic and cultural factors in the implementation of the national programmes. Health problems of vulnerable groups- pregnant and lactating women, infants and pre-school children, occupational groups [5 hours]

5. Health programmes in India: Vector borne disease control programme, National leprosy eradication programme, National tuberculosis programme, National AIDS control programme, National programme for control of blindness, Iodine deficiency disorders (IDD) programme, Universal Immunisation programme, Reproductive and child health programme, National cancer control programme, National mental health programme. National diabetes control programme, National family welfare programme, National sanitation and water supply programme, Minimum needs programme [7 hours]

6. Demography and Family Planning: Demographic cycle, Fertility, Family planning- objectives of national family planning programme and family planning methods, A general idea of advantage and disadvantages of the methods. [5 hours]

7. Preventive Medicine in Obstetrics, Paediatrics and Geriatrics: MCH problems, Antenatal, Intranatal and post natal care, Care of children, Child health problems, Rights of child and National policy for children, MCH services and indicators of MCH care, Social welfare programmes for women and children, Preventive medicine and geriatrics. [8 hours]

8. Nutrition and Health: Classification of foods, Nutritional profiles of principal foods, Nutritional problems in public health, Community nutrition programmes [6 hours]

9. Environment and Health: Components of environment, Water and air pollution and public health: Pollution control, Disposal of waste, Medical entomology. [5 hours]

10. Hospital waste management: Sources of hospital waste, Health hazards, Waste management [3 hours]

11. Disaster Management: Natural and manmade disasters, Disaster impact and response, Relief phase, Epidemiologic surveillance and disease control, Nutrition, Rehabilitation, Disaster preparedness [5 hours]

12. Occupational Health: Occupational environment, Occupational hazards, Occupational diseases, Prevention of occupational diseases. Social security and other measures for the protection from occupational hazard accidents and diseases. Details of compensation acts. [5 hours]

13. Mental Health: Characteristics of a mentally healthy person, Types of mental illness, Causes of mental ill health, Prevention, Mental health services, Alcohol and drug dependence. Emphasis on community aspects of mental health. Role of Physiotherapist in mental health problems such as mental retardation. [5 hours]

14. Health Education: Concepts, aims and objectives, Approaches to health education, Models of health education, Contents of health education, Principles of health education, Practice of health education [5hours]

RESEARCH METHODOLOGY AND BIOSTATISTICS

Course Description

This course will introduce to the student the basic research methodology, statistical concepts: methods of statistical analysis: and interpretation of data.

Subject Title: RESEARCH METHODOLOGY & BIOSTATISTICS

Duration: 25 – 36 Months

Total Hours: 80

Theory: 80

Lecture: 2 Hours / Week

Method of Assessment: Written

I. Research Methodology [40 Hrs]

1. Introduction to Research methodology: Meaning of research, objectives of research, Motivation in research, Types of research & research approaches, Research methods vs methodology, Criteria for good research, Problems encountered by researchers in India.

2. Research problem: Statement of research problem, Statement of purpose and objectives of research problem, Necessity of defining the problem

3. Research design: Meaning of research design, Need for research design, Features for good design, Different research designs, Basic principles of research design

4. Sampling Design: Criteria for selecting sampling procedure, Implications for sample design, steps in sampling design, characteristics of good sample design, Different types of sample design

5. Measurement & scaling techniques: Measurement in research- Measurement scales, sources of error in measurement, Technique of developing measurement tools, Meaning of scaling, its classification, Important scaling techniques.

6. Methods of data collection: Collection of primary data, collection data through questionnaires & schedules, Difference between questionnaires & schedules.

7. Sampling: Sampling fundamentals, need for sampling & some fundamental definitions, Important sampling distributions

8. Processing & analysis of data: Processing operations, problems in processing, Types of analysis, Statistics in research, Measures of central tendency, Dispersion, Asymmetry, relationship.

9. Testing of hypothesis: What is hypothesis? Basic concepts concerning testing of hypothesis, Procedure of hypothesis testing, measuring the power of hypothesis test, Tests of hypothesis, limitations of the tests of hypothesis

10. Computer technology: Introduction to Computers, computer application in research, computers & researcher.

II. Biostatistics [40 Hrs]

1. Introduction: Meaning, definition, characteristics of statistics., Importance of the study of statistics, Branches of statistics, Statistics and health science including Physiotherapy, Parameters and Estimates, Descriptive and inferential statistics, Variables and their types, Measurement scales.

2. Tabulation of Data: Basic principles of graphical representation, Types of diagrams histograms, frequency polygons, smooth frequency polygon, cumulative frequency curve, Normal probability curve.

3. Measure of Central Tendency: Need for measures of central Tendency, Definition and calculation of mean – ungrouped and grouped, Meaning, interpretation and calculation of median ungrouped and grouped., Meaning and calculation of mode, Comparison of the mean, median and mode, Guidelines for the use of various measures of central tendency.

4. Probability and Standard Distributions: Meaning of probability of standard distribution, The binominal distribution, The normal distribution, Divergence from normality – skewness, kurtosis.

5. Sampling techniques: Need for sampling - Criteria for good samples, Application of sampling in community, Procedures of sampling and sampling designs errors, Sampling variation and tests of significance.

6. Analysis of variance & covariance: Analysis of variance (ANOVA), what is ANOVA?s Basic principle of ANOVA, ANOVA technique, Analysis of Co variance (ANACOVA)

ETHICS & MANAGEMENT

Subject Title: ETHICS & MANAGEMENT

Duration: 25 – 36 Months

Total Hours: 40

Theory / Lecture: 1 Hour / Week

Method of Assessment: Written

ETHICS

1. History of Physiotherapy, Ethical principles in health care, Ethical principles related to Physiotherapy, Scope of practice, Enforcing standards in health profession promoting quality care, Professional ethics in research, education and patient care delivery, Informed consent issues, Medical ethics and Economics in clinical decision making. [6 hours]

2. Rules of professional conduct [6 hours]

- Physiotherapy as a profession
- Relationship with patients
- Relationship with health care institutions
- Relationship with colleagues and peers

- Relationship with medical and other professional.

3. Confidentiality and Responsibility, Malpractice and negligence, Provision of services and, advertising, Legal aspects: Consumer protection act, Legal responsibility of physiotherapist for their action in professional context and understanding liability and obligations in case of medico-legal action [6 hours]

4. IAP, CSP, APTA, WCPT– Aims Objectives and Methods of functioning for the betterment of Physiotherapy Profession [6 hours]

MANAGEMENT

1] Management studies related to –local health care organization management & structure, planning delivery with quality assurance & funding of service delivery – use of information technology -Time management -career development in Physiotherapy [6 hours]

2].Public relations in hospital and human resource management. [5 hours]

3] Planning and implementation of commercial projects, including setting up a Physiotherapy Clinic. [5 hours]

IV YEAR BPT

NEUROLOGY AND NEURO SURGERY

Subject Description

The subject is to provide the knowledge about relevant aspects about neurological disorders and surgery. The student will have a general understanding of the diseases, The therapists would encounter in their practice .The objective of the course is that after specified hours of lectures and discussions the student will be able to list the etiology, pathology, clinical features and decide the Physiotherapy treatment methods for various neurological conditions.

Subject Title: Neurology and Neuro Surgery

Duration: 37-48 months

Total Hours: 80

Theory: 80 hours

Total Hours/ week: 2 hours

Method of Assessment: Written

Theory: 80 hours

1. Basic Neuro Anatomy and Neurophysiology including Development of nervous system. (5 hours)

2. Clinical symptomatology in Neurology (7 hours)

a. Pain and Sensory symptoms

b. Motor

c. Symptoms from the special organs

d. Higher brain functions

e. Autonomic Nervous System

f. Neurogenic Bladder and Bowel

3. Application of Neuro Physiology in clinical evaluation, investigations, differential diagnosis of Neurological conditions. (8 hours)

4. Definitions, Etiology, Pathology, Clinical Presentations, Diagnostic approaches including radio diagnosis, Differential Diagnosis, Complication and Medico – Surgical Management of

Pediatric Neurological Disorders (10 Hours)

a. Cerebral Palsy

b. Mental Retardation

c. Developmental Delay

- d. Autism Spectrum Disorders
 - e. Down's syndrome
 - f. Spina Bifida
 - g. Hydrocephalus
 - h. Infantile Hemiplegic
 - i. Epilepsy
 - j. Poliomyelitis
 - k. Muscular Dystrophies
5. Definitions, Etiology, Pathology, Clinical Presentations, Diagnostic approaches including radio diagnosis, Differential Diagnosis, Complication and Medico – Surgical Management of Infections and Inflammation of the Nervous System **(10 Hours)**
- a. Meningitis
 - b. Encephalitis
 - c. Neuro Syphilis
 - d. Poliomyelitis
 - e. Peralpheral Neuritis
 - f. Tetanus
 - g. Infective and Post Infective Neuropathies
 - h. Infective Myelopathies
 - i. Spinal Arachonditis
 - j. Tabes Dorsalis
 - k. Transverse Myelitis

6. Definitions, Etiology, Pathology, Clinical Presentations, Diagnostic approaches including radio diagnosis, Differential Diagnosis, Complication and Medico – Surgical Management of Degenerative and Demyelination of CNS **(10 Hours)**

a. Basal ganglia: Parkinsonism, Huntington Disease, Associated Dyskinesia, Dystonia, Rett's Syndrome etc

b. Cerebellar: Friedrich's and Cerebellar ataxia

c. Cerebrum: Alziemers Disease, Demetia, Multiple Sclerosis

d. Spinal Cord: Non compressive Myelopathy

e. Perepheral Nerve: Diabetic, Metabolic Neuropathies, NMJ disorders, Motor Neuron Disease

7. Definitions, Etiology, Pathology, Clinical Presentations, Diagnostic approaches including radio diagnosis, Differential Diagnosis, Complication and Medico – Surgical Management of Trauma of Nervous System **(8 Hours)**

a. Head Injury

b. Spinal Cord Injury

c. Peripheral Nerve Injury

8. Definitions, Etiology, Pathology, Clinical Presentations, Diagnositc approaches including radio diagnosis, Differential Diagnosis, Complication and Medico – Surgical Management of Compression of Nervous System **(8 Hours)**

a. Brain Tumor

b. Cranio Vertebral Junction anomalies

c. Spinal Cord Tumor

d. Syringomyelia

e. Inter Vertebral Disc Prolapse

f. Tumors on the peripheral nervous system

g. Entrapment Neuropathies

9. Definitions, Etiology, Pathology, Clinical Presentations, Diagnostic approaches including radio diagnosis, Differential Diagnosis, Complication and Medico – Surgical Management of Vascular Insult to Nervous System **(8 Hours)**

a. CVA

b. Vertebral Stroke

c. Moya Moya Disease

d. VBI

10. Definitions, Etiology, Pathology, Clinical Presentations, Diagnostic approaches including radio diagnosis, Differential Diagnosis, Complication and Medico – Surgical Management of Nervous system due to Toxic, Metabolic injuries and Nutritional disorders **(6 Hours)**

a. Metabolic encephalopathies

b. B₁₂ Deficiency

c. Alcohol related disorders

d. Nutritional Polyneuropathies

e. Neurolathyrism

PHYSIOTHERAPY IN NEUROLOGY & NEURO SURGERY

Subject Description

The subject is designed to provide knowledge in assessment, diagnosis and planning Physiotherapy interventions in various Neurological disorders and Neuro surgical conditions. The student must be able to assess and diagnose the patient as necessary, to monitor the patient's vital signs, to monitor the patient in regard to treatment, and to independently provide appropriate interventions to patient considering current evidence based guidelines.

Subject : Physiotherapy in Neurology and neurosurgery

Duration : 37-48 months

Total Hours : 240

Theory : 80 hours

Practical : 160 hours

Total Hours per week : 6 hours

Method of Assessment: Written, Oral, Practical

1. Introduction to Motor Control & Motor Learning, Introduction to Neural Plasticity (5 Hours)

2. Introduction to various Neuro Developmental Approaches: Bobath, Roods, PNF, Brunnstorm, MRP, CIMT, Muscle Strengthening Approach, Virtual Reality, Mental Imagery, Robotics, Body Weight Supported Treadmill Training Techniques, Sensory Integration, Biofeedback in Neuro Rehabilitation, FNMS, Sensory Reeducation etc (16 Hours).

3. Physiotherapy Evaluation including Neuro developmental Screening, differential diagnosis of Pediatric Nervous system and Practical application of various motor control theories in (15 Hours)

1. Cerebral Palsy
2. Mental Retardation
3. Autism Spectrum Disorders
4. Down's syndrome
5. Spina Bifida
6. Hydrocephalus
7. Infantile Hemiplegic
8. Epilepsy
9. Poliomyelitis
10. Muscular Dystrophies

4. Physiotherapy Evaluation, outcome measurements, differential diagnosis, Investigations (including Radiodiagnosis, electro physiology, lab studies, non invasive procedures) of Nervous system Practical application of Physiotherapeutics in :

Inflammation of the Nervous System (8 hours)

1. Meningitis
2. Encephalitis
3. Neuro Syphilis
4. Poliomyelitis
5. Peripheral Neuritis
6. Tetanus
7. Infective and Post Infective Neuropathies
8. Infective Myelopathies
9. Spinal Arachnoiditis
10. Tabes Dorsalis
11. Transverse Myelitis

Degenerative and Demyelination of CNS (8 hours)

1. Basal ganglia: Parkinsonism, Huntington Disease, Associated Dyskinesia, Dystonia, Rett's Syndrome etc
2. Cerebellar: Friedrich's and Cerebellar ataxia

3. Cerebrum: Alzheimer's Disease, Dementia, Multiple Sclerosis
4. Spinal Cord: Non compressive Myelopathy
5. Peripheral Nerve: Diabetic, Metabolic Neuropathies, NMJ disorders, Motor Neuron Disease

Trauma of Nervous System (8 hours)

1. Head Injury
2. Spinal Cord Injury
3. Peripheral Nerve Injury

Compression of Nervous System (8 hours)

1. Brain Tumor
2. Cranio Vertebral Junction anomalies
3. Spinal Cord Tumor
4. Syringomyelia
5. Inter Vertebral Disc Prolapse
6. Tumors on the peripheral nervous system
7. Entrapment Neuropathies

Vascular Insult to Nervous System (8 hours)

1. CVA
2. Vertebral Stroke
3. Moya Moya Disease
4. VBI

Toxic, Metabolic injuries and Nutritional disorders (2 hours)

1. Metabolic encephalopathies
2. B12 Deficiency
3. Alcohol related disorders
4. Nutritional Polyneuropathies
5. Neurolathyrism

5. Practical application of Physiotherapeutics in Neurogenic Bowel and Bladder disorders (2 Hours)

PRACTICALS: 160 hours

Practical shall be conducted for all the relevant topics discussed in theory in the following forms:

1. Bedside case presentations and case discussions in the wards
2. Demonstration of application of Neuro Physiotherapeutic techniques on patients in Physiotherapy O.P.D
3. Participation under faculty guidance in management.
4. Lab sessions consisting of evaluation and assessment methods on student models, treatment techniques and practice sessions.

ORTHOPEDICS & SPORTS MEDICINE

Subject Description

This subject follows the basic science subjects to provide the knowledge about orthopedic conditions the therapists would encounter in their practice. The objective of this course is that after 60 hrs of lectures and discussion the student will be able to demonstrate an understanding of orthopedic conditions causing disability, list the etiology, clinical features and methods of Investigations and management.

Subject Title: ORTHOPEDICS & SPORTS MEDICINE

Duration: 37 – 48 Months

Total Hours: 80

Theory / Lecture: 2 Hours / Week

Method of Assessment: Written

1. Introduction [3 Hours] Introduction to orthopaedics. Clinical examination in an Orthopedic patient. Common investigative procedures. Radiological and Imaging techniques in Orthopaedics. Inflammation and repair, Soft tissue healing.

2. Traumatology [5 Hours] Fracture: definition, types, signs and symptoms. Fracture healing. Complications of fractures. Conservative and surgical approaches. Principles of management – reduction (open/closed, immobilization etc). Subluxation/ dislocations – definition, signs and symptoms, management (conservative and operative).

3. Fractures and Dislocations of Upper Limb [10 Hours] Fractures of Upper Limb - causes, clinical features, mechanism of injury, complications, conservative and surgical management of the following fractures: Fractures of clavicle and scapula. Fractures of greater tuberosity and neck of humerus. Fracture shaft of humerus. Supracondylar fracture of humerus. Fractures of capitulum, radial head, olecranon, coronoid, and epicondyles. Side swipe injury of elbow. Both bone fractures of ulna and radius. Fracture of forearm – Monteggia, Galeazzi fracture – dislocation. Chauffeur's fracture, Colle's fracture. Smith's fracture. Scaphoid fracture. Fracture of the metacarpals. Bennett's fracture. Fracture of the phalanges. (Proximal and middle.) Dislocations of Upper Limb - Anterior dislocation of shoulder – mechanism of injury, clinical feature, complications, conservative management (Kocher's and Hippocrates maneuver), surgical management (Putti-Platt, Bankart's) etc. Recurrent dislocation of shoulder. Posterior dislocation of shoulder – mechanism of injury, clinical features and management. Posterior dislocation of elbow – mechanism of injury, clinical feature, complications & management.

4. Fracture of Spine [6 Hours] Fracture of Cervical Spine - Mechanism of injury, clinical feature, complications (quadriplegia); Management- immobilization (collar, cast, brace and traction); Management for stabilization, management of complication (bladder and bowel, quadriplegia). Clay shoveller's fracture. Hangman's fracture. Fracture odontoid. Fracture of atlas. Fracture of Thoracic and Lumbar Regions - Mechanism of injury, clinical features, management – conservative and surgical of common fractures around thoracic and lumbar regions. Fracture of coccyx. Fracture of Rib Cage - Mechanism of injury, clinical features, management for Fracture Ribs, Fracture of sternum.

5. Fractures and Dislocations of Lower Limb [10 Hours] Fracture of Pelvis and Lower Limb - causes, clinical features, mechanism of injury, complications, conservative and surgical management of the following fractures: Fracture of pelvis. Fracture neck of femur – classification, clinical features, complications, management - conservative and surgical. Fractures of trochanters. Fracture shaft femur—clinical features, mechanism of injury, complications, management-conservative and surgical. Supracondylar fracture of femur. Fractures of the condyles of femur. Fracture patella. Fractures of tibial condyles. Both bones fracture of tibia and fibula. Dupuytren's fracture. Pott's fracture – mechanism of injury, management. Bimalleolar fracture Trimalleolar fracture Fracture calcaneum – mechanism of injury, complications and management. Fracture of talus. Fracture of metatarsals—stress fractures jone's fracture. Fracture of phalanges. Dislocations of Lower Limb - mechanism of injury, clinical features, complications, management of the following dislocations of lower limb. Anterior dislocation of hip. Posterior dislocation of hip. Central dislocation of hip. Dislocation of patella. Recurrent dislocation of patella.

6. Soft Tissue Injuries [6 Hours] - Define terms such as sprains, strains, contusion, tendinitis, rupture, tenosynovitis, tendinosis, bursitis. Mechanism of injury of each, clinical features, managements- conservative and surgical of the following soft tissue injuries: Meniscal injuries of knee. Cruciate injuries of knee. Medial and lateral collateral injuries of knee. Lateral ligament of ankle. Wrist sprains. Strains-quadriceps, hamstrings, calf, biceps, triceps etc. Contusions- quadriceps, gluteal, calf, deltoid etc. Tendon ruptures-Achilles, rotator cuff muscles, biceps, pectorals etc.

7. Hand Injuries [4 Hours]- mechanism of injury, clinical features, and management of the following - Crush injuries. Flexor and extensor injuries. Burn injuries of hand. 8. Amputations [2 Hours] - Definition, levels of amputation of both lower and upper limbs, indications, complications.

8. Traumatic Spinal Cord Injuries [3 Hours] - Clinical features, complications, medical and surgical management of Paraplegia and Quadriplegia.

9. Deformities [6 Hours] - Clinical features, complications, medical and surgical management of the following Congenital and Acquired deformities. Congenital

Deformities - CTEV. CDH. Torticollis. Scoliosis. Flat foot. Vertical talus. Hand anomalies- syndactyly, polydactyly and ectrodactyly. Arthrogyriposis multiplex congenita (amyoplasia congenita). Limb deficiencies- Amelia and Phocomelia. Klippel feil syndrome. Osteogenesis imperfecta (fragile ossium). Cervical rib. Acquired Deformities - Acquired Torticollis. Scoliosis. Kyphosis. Lordosis. Genu varum. Genu valgum. Genu recurvatum Coxa vara. Pes cavus. Hallux rigidus. Hallux valgus. Hammer toe. Metatarsalgia.

10. Disease of Bones and Joints [5 Hours]: Causes, Clinical features, Complications, Management- medical and surgical of the following conditions Infective conditions: Osteomyelitis (Acute / chronic). Brodie's abscess. TB spine and major joints like shoulder, elbow, hip, knee, ankle etc. Arthritic conditions: Pyogenic arthritis, Septic arthritis, Syphilitic infection of joints. Bone tumours: classification, clinical features, management - medical and surgical of the following tumors : Osteoma. Osteosarcoma, Osteochondroma. Enchondroma. Ewing's sarcoma. Giant cell tumor. Multiple myeloma. Metastatic tumors. Perthe's disease, Slipped Capital Femoral Epiphysis and Avascular Necrosis. Metabolic Bone Diseases: Rickets. Osteomalacia, Osteopenia, Osteoporosis.

11. Inflammatory and Degenerative Conditions [5 Hours]: Causes, clinical feature, complications, deformities, radiological features, management- conservative and surgical for the following conditions :Osteoarthritis. Rheumatoid arthritis. Ankylosing spondylitis Gouty arthritis. Psoriatic arthritis. Hemophilic arthritis. Still's disease (juvenile rheumatoid arthritis). Charcot's joints. Connective Tissue Disorders- Systemic Lupus Erythematosus, Scleroderma, Dermatomyositis, Poliomyelitis, Mixed connective tissue Disease (MCTD)

12. Syndromes [3 Hours]: Causes, Clinical features, complications, management- conservative and surgical of the following : Cervico brachial syndrome. Thoracic outlet syndrome. Vertebro- basilar syndrome. Scalenus syndrome. Costo clavicular syndrome. Levator scapulae syndrome. Piriformis syndrome

13. Neuromuscular Disorders [3 hours]: Definition, causes, clinical feature, complications, management. (Multidisciplinary approach) medical and surgical of the following conditions : Cerebral palsy. Poliomyelitis. Spinal Dysraphism. Leprosy.

14. Cervical and Lumbar Pathology [3 Hours]: Causes, clinical feature, pathophysiology, investigations, management-Medical and surgical for the following : Prolapsed intervertebral disc (PID), Spinal Canal Stenosis. Spondylosis (cervical and lumbar) Spondylolysis. Spondylolisthesis. Lumbago/ Lumbosacral strain. Sacralisation. Lumbarisation. Coccydynia. Hemivertebra.

15. Orthopedic Surgeries [3 Hours]: Indications, Classification, Types, Principles of management of the following Surgeries :Arthrodesis. Arthroplasty (partial and total replacement). Osteotomy , External fixators. Spinal stabilization surgeries (Harrington's, Luque's, Steffi plating) etc , Limb re-attachments.

16. Regional Conditions [5 Hours]: Definition, Clinical features and management of the following regional conditions

- a. Shoulder: Periarthritic shoulder (adhesive capsulitis). Rotator cuff tendinitis. Supraspinatus Tendinitis. Infraspinatus Tendinitis. Bicipital Tendinitis. Subacromial Bursitis.
- b. Elbow: Tennis Elbow. Golfer's Elbow. Olecranon Bursitis (student's elbow). Triceps Tendinitis.
- c. Wrist and Hand: De Quervain's Tenosynovitis. Ganglion. Trigger Finger/ Thumb. Mallet Finger, Carpal Tunnel Syndrome, Dupuytren's Contracture.
- d. Pelvis and Hip: IT Band Syndrome. Piriformis Syndrome. Trochanteric Bursitis.
- e. Knee: Osteochondritis Dissecans. Prepatellar and Suprapatellar Bursitis. Popliteal Tendinitis. Patellar Tendinitis. Chondromalacia Patella. Plica Syndrome. Fat Pad Syndrome (Hoffa's syndrome).
- f. Ankle and Foot: Ankle Sprains. Plantar Fasciitis / Calcaneal Spur. Tarsal Tunnel Syndrome. Achilles Tendinitis. Metatarsalgia. Morton's Neuroma.

PHYSIOTHERAPY IN ORTHOPEDICS & SPORTS

Subject Description

The subject serves to integrate the knowledge gained by the students in orthopedics and traumatology with skills to apply these in clinical situations of dysfunction and musculoskeletal pathology. The objective of the course is that after the specified hours of lectures and demonstrations the student will be able to identify, assess and diagnose movement dysfunction and functional limitations due to musculoskeletal diseases, independently plan and set treatment goals and apply the skills gained in exercise therapy and electrotherapy in these clinical situations to restore musculoskeletal function considering current evidence based guidelines.

Subject Title: PHYSIOTHERAPY IN ORTHOPEDICS & SPORTS

Duration: 37 – 48 Months

Total Hours: 240

Theory: 80 Hours

Practical: 160 Hours

Total Hours / Week: 6 Hrs

Method of Assessment: Written, Oral, Practical

1. PT assessment for Orthopedic conditions - SOAP format. Subjective - history taking, informed consent, personal, past, medical and socioeconomic history, chief complaints, history of present illness. Pain assessment- intensity, character, aggravating and relieving factors, site and location. Objective- on observation - body built swelling, muscle atrophy, deformities, posture and gait. On palpation- tenderness-grades, muscle spasm, swelling-methods of swelling assessment, bony prominences, soft tissue texture and integrity, warmth and vasomotor disturbances. On examination – ROM – active and passive, resisted isometric tests, limb length apparent, true and segmental , girth measurement, Muscle imbalance and muscle length testing-tightness, contracture and

flexibility, manual muscle testing, peripheral neurological examination dermatomes, myotomes and reflexes, special tests and functional tests. Physical diagnosis and differential diagnosis, Prescription of home program. Documentation of case records, and follow up. Various methods of Measurement of outcomes **[6 Hours]**

2. Fractures - Physiotherapy assessment in fracture cases. Aims of PT management in fracture cases - short and long term goals. Principles of PT management in fractures - Guidelines for fracture treatment during period of immobilization and guidelines for treatment after immobilization period. PT management in complications - early and late - shock, compartment syndrome, VIC, fat embolism, delayed and mal union, RSD, myositis ossificans, AVN, pressure sores etc. **[4 Hours]**

3. Specific fractures and dislocations: PT assessment and management of upper limb fractures and dislocations. PT assessment and management of lower limb fractures and dislocations including pelvis. PT assessment and management spinal fractures. **[4 Hours]**

4. Selection and application of physiotherapeutic techniques, maneuver's, modalities for preventive, curative and rehabilitative means in all conditions. [2 Hours]

5. Principles of application of various schools of thought in manual therapy. (Briefly Maitland and Mc kenzie). [2 Hours]

6. Degenerative and Inflammatory conditions: Definition, signs and symptoms, clinical features, patho physiology, radiological features, deformities, medical, surgical management. Describe the PT assessment and management and home program for the following conditions – Osteoarthritis - emphasis mainly on knee, hip and hand, Rheumatoid Arthritis, Ankylosing spondylitis, Gout, Perthes disease, Periarthritic shoulder. **[3 Hours]**

7. Infective conditions: Definition, signs and symptoms, clinical features, pathophysiology, radiological features, medical, surgical management. Describe PT assessment and management for following conditions – Osteomyelitis – acute and chronic, Septic arthritis, Pyogenic arthritis, TB spine and major joints - knee and hip. **[2 Hours]**

8. Define, review the postural abnormalities of spinal column, clinical features, deformities, medical and surgical management. Describe PT assessment and management and home program. [2 Hours]

9. Deformities: Review in detail the causes, signs and symptoms, radiological features, medical and surgical management. Describe the PT. assessment and management of the following conditions : Congenital : CTEV, CDH, Torticollis, pes planus, pes cavus and other common deformities. Acquired: scoliosis, kyphosis, coxa vara, genu varum, valgum and recurvatum. **[3 Hours]**

10. Poliomyelitis: Definition, etiology, types, pathophysiology, clinical features, deformities, medical and surgical management. PT. assessment and management after surgical corrections and reconstructive surgeries - emphasis on tendon transfer and home program. [2 Hours]

11. Leprosy: Definition, cause, clinical features, medical and surgical management. PT assessment, aims, and management after surgical procedures such as tendon transfer both pre and post operatively. **[2 Hours]**

12. Amputations: Definition, levels, indications, types, PT assessment, aims, management pre and post operatively. PT management with emphasis on stump care and bandaging. Pre and post prosthetic training, checking out prosthesis, complications of amputations and its management. **[4 Hours]**

13. Spinal conditions: Review the causes, signs and symptoms, investigations, radiological features, neurological signs. PT assessment, aims, and management and home program of the following conditions: Cervical spondylosis, Lumbar spondylosis, Spondylolisthesis, Spinal canal stenosis, Spondylolysis, Sacro-iliac joint dysfunction, Sacralisation, Lumbarisation, Intervertebral disc prolapse, Coccydynia, Spina bifida occulta. **[7 Hours]**

14. Traction: Effects of spinal traction, types of traction, modes of application, indications for spinal traction, contraindications, precautions, limitations of traction. **[2 Hours]**

15. Osteoporosis- Causes, predisposing factors, investigations and treatment. **[1 Hour]**

16. Orthopedic surgeries: Pre and post operative PT assessment, goals, precautions and PT management of following surgeries such as : Arthrodesis, Osteotomy, Arthroplasty- partial and total - Excision arthroplasty, excision arthroplasty with implant, interpositional arthroplasty and total replacement; Tendon transplant, Soft tissue release- tenotomy, myotomy, lengthening; Arthroscopy, Spinal stabilization, Re-attachment of limbs, External fixators, Synovectomy. **[5 Hours]**

17. Shoulder joint: Shoulder instabilities, TOS, RSD, Impingement syndrome – conservative and Post operative PT management. Total shoulder replacement and Hemi replacement. - Post operative PT management. AC joint injuries - rehabilitation. Rotator cuff tears conservative and surgical repair. Subacromial decompression - Post operative PT management. **[3 Hours]**

18. Elbow and forearm: Excision of radial head - Post operative PT management. Total elbow arthroplasty- Post operative PT management. **[2 Hours]**

19. Wrist and Hand: Total wrist arthroplasty. Repair of ruptured extensor tendons. Carpal tunnel syndrome. Flexor and extensor tendon lacerations - Post operative PT management. **[3 Hours]**

20. Hip: Joint surgeries - hemi and total hip replacement - Post operative PT management Tendonitis and bursitis. - Management. **[2 Hours]**

21. Knee: Lateral retinacular release, chondroplasty- Post operative management. Realignment of extensor mechanism. ACL and PCL reconstruction surgeries - Post operative rehabilitation. Meniscectomy and meniscal repair - Post operative management. Plica syndrome, patellar dysfunction and Hoffa's syndrome- conservative management. TKR- rehabilitation protocol. Patellar tendon ruptures and Patellectomy- rehabilitation. **[5 Hours]**

22. Ankle and foot: Ankle instability. Ligamentous tears- Post operative management. **[2 Hour]**

23. Sports Physiotherapy: Physical fitness. Sports diet, Stages of soft tissue healing. Treatment guidelines for soft tissue injuries- Acute, Sub acute and chronic stages. Repair of soft tissues- rupture of muscle, tendon and Ligamentous tears. Soft tissue injuries- prevention and rehabilitation of, Lateral ligament sprain of ankle. Rotator cuff injuries. Collateral and Cruciate injuries of knee. Meniscal injuries of knee. Supraspinatus and Bicipital tendonitis . Pre patellar and Subacromial bursitis. Tennis and Golfer's elbow. Hamstring strains, Quadriceps contusion, TA rupture. Dequervain's tenosynovitis. Trigger and Mallet finger. Plantar fasciitis. Wrist sprains. Prevention of sports injuries, Doping
[12 Hours]

Practical: 160 Hours

Practical shall be conducted for all the relevant topics discussed in theory in the following forms:

1. Bedside case presentations and case discussions in the wards
2. Demonstration of application of Physiotherapeutic techniques on patients in Physiotherapy O.P.D
3. Participation under faculty guidance in management.
4. Lab sessions consisting of evaluation and assessment methods on student models, treatment techniques and practice sessions.

Desirable – Participation in management of injuries on sports field

PHYSIOTHERAPY IN COMMUNITY HEALTH

Subject Description

The subject serves to integrate the knowledge gained by the students in community medicine and other areas, with Physiotherapy skills to apply these in clinical situations of health and disease and its prevention. The objective of the course is that after the specified hours of lectures and demonstrations the student will be able to identify Physiotherapy methods to promote health, fitness and to prevent ill health, disabilities and dysfunctions due to various disease conditions and plan, set, prescribe and implement treatment goals considering current evidence based guidelines.

Subject Title: PHYSIOTHERAPY IN COMMUNITY HEALTH

Duration: 37 – 48 Months

Total Hours : 240

Theory : 80 Hours

Practical : 160 Hours

Total Hours / Week : 6

Method of Assessment: Written, Oral, Practical

Theory [80 Hours]

1] Concepts of community health [preventive, promotive, restorative and rehabilitative] [2 Hours]

2] (a) Introduction to rehabilitation [4 Hours]

Philosophy and need of rehabilitation. Principles of Physical medicine. Role of members of rehabilitation team. Basic Principles of Administration and Organization

(b) Disability Prevention and Rehabilitation: Concepts of impairment, disability and functional limitations or Handicap. Disability evaluation methods and purposes.

3] Principles of Community based Rehabilitation: WHO definition of health and disease, Health delivery system – strategies of 3tier health delivery system, Disability types (Physical & Psychological), evaluation, prevention & Legislation related to Persons with Disability (PWD) **[4 Hours]**

4] Introduction to CBR : Definition, principles, types {institutional, reach out and community), concepts, WHO policies, principles of Team work of medical practitioner, Physiotherapist, Occupational Therapist, Speech & Audiology Therapist, Prosthetist & Orthotist, Clinical psychologist, vocational counsellor and social worker, Role of PT in team, concept of multi –purpose health worker. **[6 Hours]**

5] Role of Physiotherapy in CBR: Screening for disabilities, Prescribing exercise programme, Prescribing and devising low cost locally available assistive aids, Modifications physical and architectural barriers for disabled, Disability prevention, Strategies to improve ADL, Rehabilitation programmes for various neuromusculoskeletal and cardiothoracic disabilities.

[5 Hours]

6] Disability prevention and rehabilitation: Concept of impairment, Disability and Handicap or Functional Limitation, Disability evaluation methods and purpose **[2 Hours]**

7] Legal aspects of disability: Compensation and benefits. Government's policies and rehabilitation Council. Concept of Barrier free environment **[1 Hour]**

Role of voluntary Organizations in CBR: Charitable Organizations, Voluntary health agencies –National level and International NGO's, Multilateral and Bilateral agencies. International Health Organizations. **[2 Hours]**

National District Level Rehabilitation Programme: Primary rehabilitation unit, Regional training center, District rehabilitation center, Primary Health center, Village rehabilitation worker, Anganwadi worker **[2 Hours]**

Vocational training in rehabilitation: Introduction, Need, Vocational evaluation, Vocational rehabilitation services **[1 Hours]**

8] Role of Other Allied Therapies in Rehabilitation: [4 Hours]

(a)Occupational therapy: Introduction to Occupational therapy, Philosophy and principles of Occupational Therapy, Therapeutic Media and Modalities in O.T, Role of O.T in Mental Health Physical Function and well being.

(b) Speech and Language disorders and rehabilitation: Brief description of Anatomy and physiology, Classification of the disorders and respective management strategies.

9] Principles of Othotics, Prosthetics, Mobility Aids and Assistive Devices. [8 Hours]

(a) Principles of Orthotics: Indications Prescription and training in usage Lower Extremity Orthotic, Upper Extremity Orthotic Spinal Orthotic

(b)Principles of Prosthetics: Indications Prescription and training in usage Lower Extremity Prosthetics and Upper Extremity Prosthetics

(c)Mobility aids and assistive devices: Principles involved in prescribing, Classification, and Levels and Methods of training in use.

10] Community Health Care – [8 Hours]

Prevention, Promotion & Restoration

- a. In Peri Pubertal age group
- b. In women-pregnancy, menopause
- c. In neuromusculoskeletal, Cardiovascular, Pulmonary, metabolic and degenerative conditions
- d. In Obese / Over weight
- e. In Cardiovascular conditions
- f. In Diabetes
- g. In Sport Person (Identify risk factor & type of training)
- h. Health Promotion for All

12] Woman and child care – [8 Hours]

- a. Antenatal exercises , Specific Breathing exercises, Relaxation, Postural Training, Pelvic floor stretching and strengthening exercises with clinical reasoning
- b. Physiotherapy during labour
- c. Postnatal exercises program after normal labor / labor with invasive procedures with clinical reasoning
- d. Menopause -Osteoporosis, Mental health , Physiotherapy management
- e. Preterm babies
- f. Adolescent age group
- g. Nutritional disorders in women and children

13] Geriatrics – [8 Hours]

Physiology of Aging, Environmental changes and adaptations, Balance and falls, Physiotherapy management, Role of Physiotherapy in prolonged bed rest and in home for aged. Active aging and Aging with disabilities – WHO, Care for People with Dementias.

14] Industrial health and Occupational Diseases– [15 Hours]

I. Ability Management –

Job analysis: - Job description, Job demand Analysis, Task Analysis, Ergonomic Evaluation including Anthropometric data collection, Injury Prevention, Employee Fitness Programme
Disability Management:- Acute care, Concept of Functional Capacity Assessment, Work Conditioning, Work Hardening

II. Environmental stress in the industrial area –

- A. Physical agents e.g. heat / cold, light, noise, vibration, UV radiation, ionizing radiation
- B. Chemical agents-inhalation, local action and ingestion
- C. Mechanical hazards-overuse/fatigue injuries due to ergonomic alternation and Mechanical stresses. Mechanical stresses in –
 - i. Sedentary table work – executives, clerks
 - ii. Vehicle drivers - Inappropriate seats, Vibrations
 - iii. Constant standing-watchmen, defense forces, surgeons etc.
 - iv. Labourers- Overexertion
- D. Psychological hazards- monotonicity and dissatisfaction in job, anxiety of work completion with quality, Multi-task activities,

III Preventive and Rehabilitative Role of PT in II A, B, C & D

Practical: 160 Hours

Project – Survey/Retrospective study in community

Documentation of 2 cases each in

- a) Women's Health
- b) Geriatrics &
- c) Industrial Health (Musculoskeletal / Pulmonary conditions)
- d) Health promotion –

1 case each in

- a. Obesity
- b. Peri-pubertal age group
- c. Sports person
- d. Diabetes / Cardio-Pulmonary conditions

There shall be participation of students in health camps and projects in final year and during internship with a view to expose the students to problems of rural and semi urban areas.

The concept of health care counseling shall be incorporated in all relevant areas.

2.7 Total number of hours

Total number of hours will be 4320 hours during the four years of study.

2.8 Branches if any with definition

There are no branches for B.P.T. degree course

2.9 Teaching learning methods

Teaching learning methods will include class room lectures, practical and laboratory demonstrations, and bed side clinical demonstrations by qualified faculty and self directed learning by the students through assignments, seminar and case presentations, Institutional Visits, Outreach programs, Mobile camps and project works under the faculty guidance.

2.10 Content of each subject in each year

As in 2.6 above



2.11 No: of hours per subject

TABLE I

FIRST YEAR BPT (DURATION 0 – 12 MONTHS)					
S No.	Subjects	Teaching hours			
		Hours/Week	Theory	Practical	Total
<i>Main subjects: For University Examination</i>					
01	Anatomy	8	160	160	320
02	Physiology	8	160	160	320
03	Biomechanics & Kinesiology	8	160	160	320
04	Psychology	2	80	-	80
05	Sociology	2	80	-	80
<i>Subsidiary subjects: Not for University Examination</i>					
06	Biochemistry	2	80	-	80
07	First Aid & Nursing	2	60	20	80
08	Nutrition	1	40	-	40
09	Orientation to Physiotherapy	1	40	-	40
10	Communicative English	1	40	-	40
11	Seminar	1	40	-	40
12	Total	36	910	530	1440

TABLE II

SECOND YEAR BPT (DURATION 13 – 24 MONTHS)					
S No.	Subjects	Teaching hours			
		Hours/Week	Theory	Practical/Clinical	Total
Main subjects: For University Examination					
01	Electrotherapy	8	120	200	320
02	Exercise therapy	8	120	200	320
03	Pharmacology	2	80	-	80
04	Microbiology	2	80	-	80
05	Pathology	2	80	-	80
Subsidiary subjects: Not for University Examination					
06	Computer Science	2	40	40	80
07	Medical Instrumentation	2	60	20	80
08	Seminar	2	80	-	80
09	Supervised Clinical Observation	8	-	320	320
10	Total	36	660	780	1440

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TABLE III

THIRD YEAR BPT (DURATION 25 – 36 MONTHS)					
S No.	Subjects	Teaching hours			
		Hours/Week	Theory	Practical/Clinical	Total
<i>Main subjects: For University Examination</i>					
01	General Medicine & General Surgery	2	80	-	80
02	Physiotherapy in General Medicine & General Surgery	6	80	160	240
03	Cardio- Respiratory disorders & Surgery	2	80	-	80
04	Physiotherapy in Cardio-Respiratory disorders & Intensive Care management	6	80	160	240
05	Community Medicine	2	80	-	80
<i>Subsidiary subjects: Not for University Examination</i>					
06	Research methodology & Biostatistics	2	80	-	80
07	Ethics and Management	1	40	-	40
08	Seminar	1	40	-	40
09	Supervised Clinical Practice	14	-	560	560
10	Total	36	560	880	1440

TABLE IV

FORTH YEAR BPT (DURATION 37– 48 MONTHS)					
S No.	Subjects	Teaching hours			
		Hours/Week	Theory	Practical/Clinical	Total
<i>Main subjects: For University Examination</i>					
01	Neurology & Neurosurgery	2	80	-	80
02	Physiotherapy in Neurology & Neurosurgery	6	80	160	240
03	Orthopedics & Sports Medicine	2	80	-	80
04	Physiotherapy in Orthopedics & Sports	6	80	160	240
05	Physiotherapy in Community Health & Project	6	80	160	240
<i>Subsidiary subjects: Not for University Examination</i>					
06	Supervised Clinical Practice	14	-	560	560
07	Total	36	400	1040	1440

2.12 Practical training

Practical training should be imparted under laboratory conditions for the basic science subjects with emphasis on carrying out the experiments and tests through demonstration by relevant faculty and repeated practice by the students. For physiotherapy assessment and treatment techniques, these should be first demonstrated on human models and the students should practice on human models repeatedly until proficiency is gained. Later the techniques should be demonstrated on patients during bed side clinics and the students are encouraged to carry out the techniques on patients under strict and close supervision of faculty.

2.13 Records

In all subjects with practical components meticulous records should be kept regarding the topic of the practical training, procedure, materials and methods used, results and outcomes. The records should be submitted for inspection during practical or viva examination.

2.14 Dissertation: As per Dissertation Regulations of KUHS

2.15 Specialty training if any

Not applicable

2.16 Project work to be done if any

In the final year of the B.P.T. course, the student has to carry out a project work under the guidance of the faculty. In consultation with their guides they have to select a topic in any one of the following physiotherapy fields: Musculoskeletal and sports physiotherapy, Neuro physiotherapy, Cardio Respiratory and intensive care physiotherapy, Paediatric physiotherapy, Community Physiotherapy and General medical and surgical physiotherapy.

The project should be carried out in the following pattern:

1. Introduction
2. Aims or objectives of the project
3. Review of literature
4. Methodology: Case studies / Survey
5. Summary and Conclusion
6. References
7. Appendices

The completed project and bound report should be submitted 3 months before final university examination. The project will be evaluated through a viva examination conducted during the practical and viva examination of the subject Physiotherapy in community health.

2.17 Any other requirements [CME, Paper Publishing etc.]

The third and final year students and interns should attend at least one CME program each year preferably conducted in their own institution.

2.18 Prescribed/recommended textbooks for each subject

ANATOMY

2. SNELL [Richard S], Clinical Anatomy for Medical students : Ed. 5. Little Brown and Company Boston. 1995,
3. B.D CHAURASIA'S HUMAN ANATOMY -REGIONAL AND APPLIED; VOLUME 1, VOLUME II AND VOLUME III.
4. DATTA [A.K], Essentials of human Anatomy: Thorax and Abdomen Ed 2. Vol. I Current. Book International, Calcutta 1994 DATTA..K.J, Essentials of human Anatomy: Head and Neck Ed 2. Vol. II, Current Book International, Culcutta 1995
5. SINGH [Inderbir], Text book of anatomy with color atlas: Introduction, Osteology, upper extremity, lower extremity. Vol I. P Brothers, New Delhi 1996
6. SINGH [Inderbir], Text book of anatomy with colour atlas: Thorax and abdomen. Vol II. JP Brothers, New Delhi 1996
7. SINGH [Inderbir], Text book of anatomy with color atlas: Head and Neck Central Nervous system. Vol III. JP Brothers, New Delhi 1996
8. SINGH [Inderbir], Human Osteology. JP Brothers, New Delhi 1990

PHYSIOLOGY

1. Concise medical physiology - Chaudhuri Sujit K.
2. Human Physiology — Chatterjee C. C.
3. Text book of practical Physiology - Ranade.

4. Text of Physiology-A.K.Jain.

BIOMECHANICS AND KINESIOLOGY

1. Joint Structure and Function – A comprehensive Analysis, JP Bros Medical Publishers, New Delhi.
2. Clinical Kinesiology for Physical Therapist Assistants, JP Bros Medical Publishers, Bangalore, 1st Indian Ed 1997 4.Textbook on kinesiology by D.A. Neuman.

PSYCHOLOGY

1. Morgan et al (2003). Introduction to Psychology. New Delhi: Tata McGraw hill.
2. Mangal, S.K (2002). Advanced Educational Psychology. New Delhi: prentice hall.

SOCIOLOGY

1. Sachdeva and Vidyabushan, Introduction to the study of sociology
2. INDRANI T K, Text Books of Sociology for Graduates Nurses and Physiotherapy Students, JP Brothers, New Delhi

BIOCHEMISTRY

1. Text of Biochemistry for Medical students by Vasudevan & Sreekumari.
2. Text book of Dietetics by Sreelexmi. B
3. Handbook of food& Nutrition, Dr. Swaminathan M. The Bangalore Printing & Publishing Co, Lts.
4. Food & Nutrition facts & figures, Gupta L C, et al. New Delhi, Jaypee.
5. Text book of Foods, Nutrition & Dietetics, Raheena Beegam. M. A. New Delhi, Sterling Publishers Pvt. Ltd.

FIRST AID AND NURSING

1. First aid in emergency – St. John’s Ambulance Association.
2. First aid & management of general injuries & common ailments-Gupta & Gupta

COMMUNICATIVE ENGLISH

1. English Grammar Collins, Birmingham University, International Language Data Base, Rupa & Co. 1993
2. Wren and Martin - Grammar and Composition, 1989, Chanda.& Co, Delhi
3. Spoken English, V Shasikumar and P V Dhanija_ Pub. By: Tata Mcgraw Hill, New Delhi

ELECTROTHERAPY

1. Claytons Electrotherapy by Forster Plastangs
2. Electrotherapy Explained by Low & Reed
3. Clinical Electrotherapy by Nelson
4. Physical agents by Michile Cameroon

EXERCISE THERAPY

1. Therapeutic exercise by Carolyn kisner
2. Principles of exercise therapy by M. Dena Gardiner
3. Practical exercises therapy by Hollis Margaret
4. Therapeutic exercises by Sydney Litch
5. Therapeutic exercises by Hall & Brody
6. Beard's Massage: Principles and Practice of Soft Tissue Manipulation, Giovanni DeDomenico
7. Principles of muscle testing by Hislop

PHARMACOLOGY

1. Pharmacology in Rehabilitation 4th Edition - Charles D. Ciccone, PT, PhD
2. Pharmacology for the physical therapist - Peter C. Panus, PhD, PT Bertra, latzing MD,
3. Essential of Medical Pharmacology by Tripathi
4. Text book of Medical Pharmacology by Padmaja Udayakumar
5. Pharmacology by N. Murugesh
6. Pharmacology & Pharmacotherapeutics by Sadoskar.

MICROBIOLOGY

1. Short text book of Medical Microbiology by Sathish Gupta
2. Text book of Microbiology by Anantha Narayanan
3. Microbiology by Baveja

PATHOLOGY

1. Text book of pathology by Harshmohan
2. Text book of pathology by Robbins

MEDICAL INSTRUMENTATION

1. Handbook Of Biomedical Instrumentation – R.S Khnadpur.
2. Biomedical Instrumentation – Dr. M. Arumugham.

COMPUTER SCIENCE

1. Computer Network - Andrew S. Tanenbaum

GENERAL MEDICINE & GENERAL SURGERY

1. Davidson's Principles and Practice of Medicine
2. Harrison's Internal Medicine

GENERAL SURGERY

1. General Surgical Operations – by Kirk / Williamson
2. Bailey and Love's – Short Practice of Surgery
3. Patricia A Downie, Text book of Heart, Chest Vascular Disease for physiotherapists, JP Bros.

PHYSIOTHERAPY IN GENERAL MEDICINE AND SURGERY

1. Tidy's Physiotherapy.
2. Physical Rehabilitation Assessment and Treatment – O'Sullivan Schmitz
3. Cash's Text book of General Medicine and Surgical conditions for Physiotherapists.

CARDIO-RESPIRATORY DISORDERS & SURGERY

1. General Surgical Operations – by Kirk / Williamson

2. Surgery by Nan
3. Bailey and Love's – Short Practice of Surgery
4. Chest Disease by Crofton and Douglas.
5. Text book of Heart, Chest Vascular Disease for physiotherapists- Patrica A Downie, JP Bros.

PHYSIOTHERAPY IN CARDIO-RESPIRATORY DISORDERS & INTENSIVE CARE MANAGEMENT

1. Tidy's Physiotherapy.
2. Cash's Text Book of Chest, Heart, Vascular Disorders for Physiotherapists.
3. Cardio pulmonary Symptoms in physical Therapy practice Cohen and Michel
4. Chest Physiotherapy in Intensive Care Unit by Mackenzi
5. Cash's Text book of General Medicine and Surgical conditions for Physiotherapists.

COMMUNITY MEDICINE

1. Textbook of Preventive & Social Medicine, Dr. J E Park

RESEARCH METHODOLOGY AND BIostatISTICS

1. Elements of Health Statistics by Rao.N.S.N
2. An introduction of Biostatistics by Sunder Rao. P.S.S.
3. Methods in Bio-Statistics 6th Edn. 1997 by B.K. Mahajan
4. Biostatistics : A manual of Statistics Methods by K. Visweswara Rao

ETHICS & MANAGEMENT

1. Medical Ethics by C M Francis.
2. Management principals and application for physiotherapists

NEUROLOGY AND NEURO SURGERY

1. Victor Adams-neurology
2. Haerer: Neurological examinations
3. Neurological examination made easy

PHYSIOTHERAPY IN NEUROLOGY & NEURO SURGERY

1. Patrica Downie: Cash's book of neurology.
2. Ida Bromely : Tetraplegia & Paraplegia
3. Thomson – Tidy's Physiotherapy
4. Susan B O' Sullivan – Physical rehabilitation
5. Darcy Umphred – Neurological rehabilitation
6. Berta Bobath – Adult hemiplegia

ORTHOPEDICS & SPORTS MEDICINE

1. Text book of Orthopedics.—Maheswari.
2. Apley's Orthopedics.
3. Textbook of Orthopedics and Traumatology— M.N.Natarajan

PHYSIOTHERAPY IN ORTHOPEDICS & SPORTS

1. Tidy's Physiotherapy.
2. Textbook of orthopedics- Cash.
3. Clinical orthopedic rehabilitation- Brotzman.
4. Orthopedic Physiotherapy - Jayant Joshi.
5. Orthopedic Physical Assessment-David J Magee

PHYSIOTHERAPY IN COMMUNITY HEALTH

1. Industrial Therapy – Glenda Key
2. Geriatric Physical therapy - Andrew Guccione
3. P.S.M. - Park
4. Textbook of Women's Health – Ruth Sapsford
5. Physiotherapy in obstetrics & Gynecology -J. Mantle
6. Ergonomics- Karen Jacobs
7. Textbook of preventive & Social Med – Gupta & Mahajan

2.19 Reference books

ANATOMY

1. MOORE [Keith L], Clinically Oriented Anatomy. Ed. 3., Williams and Wilkins, Baltimore, 1992
2. Drake, Vogl & Mitinell, GRAY'S Anatomy for students, 2nd Edition, 2010 Church & Livingstone.
3. SNELL, Clinical Anatomy, 7th edition 2004 Lippincott, Williams & Wilkins.

PHYSIOLOGY

1. Text book of medical physiology - Guyton Arthur
2. Manipal Manual of Physiology - Prof. C N Chandrashekar
3. Basics of Medical histology- Venkatesh D & SudhakarHH

BIOMECHANICS AND KINESIOLOGY

1. Brunnstrom, Clinical Kinesiology, JP Bros Medical Publishers, Bangalore, 5th Ed 1996, 1st Indian Ed 1998.

PSYCHOLOGY

1. Lefton. Psychology. Boston: Alwin & Bacot Company.
2. Feldman R.H (1996). Understanding Psychology. New Delhi: Tata McGraw hill.
3. Atkinson (1996). Dictionary of Psychology.

SOCIOLOGY

3. INDRANI T K, Text Books of Sociology for Graduates Nurses and Physiotherapy Students, JP Brothers, New Delhi

BIOCHEMISTRY

6. Nutrition & Dietetics for Health care. Barrer M Helen.
7. Harper's Biochemistry by Robert K. Murray, Daryl K. Granner and Victor W. Rodwell.

FIRST AID AND NURSING

3. Physiotherapy for burns & Reconstruction - Glassey.
4. Surgical & Medical Procedures for Nurses & Paramedical staff- Nathan.

COMMUNICATIVE ENGLISH

4. Letters for all Occassions.A S Myers. Pub - Harper Perennial
5. Journalism Made Simple, D Wainwright
6. Writers Basic Bookshelf Series, Writers Digest series
7. Interviewing by Joan Clayton Platkon
8. Penguin Book of Interviews

ELECTROTHERAPY

5. Electrotherapy Evidene based practice by Sheila Kitchen
6. Principles of Electrotherapy by Michile Camreoon
7. Thermal agents by Susan Michlovitz.
8. Therapeutic modalities for physical therapists by William E Prentice

EXERCISE THERAPY

8. Physical rehabilitation by O. Sullivan
9. Muscles: Testing and Function, with Posture and Pain: by Kendall& Kendall
10. Manual mobilization of the Joints: the kaltenborn method of Joint Examination and treatment; Vol.1 – Extremities, Vol.2 – Spine: by F kaltenborn and Olaf Evjenth
11. Facilitated Stretching by Robert E McAtee and Jeff Charland
12. Light on Yoga by BKS Iyengar
13. Manual Therapy “NAGS”, “SNAGS”, “ MWMS” etc by Brian R. Mulligan
14. Myofascial Release Manual by Carol J. Manheim
15. Mobilization of Nervous System by David Butler
16. The Cervical and Thoracic spine Mechanical Diagnosis and Therapy by R A McKenzie
17. The Lumbar spine Mechanical Diagnosis and Therapy by R A McKenzie
18. Muscle energy techniques by Leon Chaitow
19. Therapeutic exercises by Barbara Bandi
20. Therapeutic exercises by Basmajjian

MICROBIOLOGY

4. Text book of Microbiology by Chakraborty
5. Text book of Microbiology by Jayaram Panicker
6. Microbiology and Parasitology by Rajeshwar Reddy

PATHOLOGY

3. Pathological Implications for Physical Therapists by Catherine Cavallaro Goodman ,
Kenda S Fuller

MEDICAL INSTRUMENTATION

3. Handbook Of Analytical Instruments – R.S Khnadpur.
4. Biomedical Instruments and Measurements - Cromwell

COMPUTER SCIENCE

2. Health Information management of a Strategic Resource - Mervat Abdelhak

GENERAL MEDICINE & GENERAL SURGERY

3. Braunwald Text of Cardiology
4. Text Book of Cardiology by Hurst

GENERAL SURGERY

4. Chest Disease by Crofton and Douglas.
5. Surgery by Nan

PHYSIOTHERAPY IN GENERAL MEDICINE AND SURGERY

4. Physical Therapy for the Cancer patient by M.C Garvey
5. Physiotherapy in Obstetrics and Gynecology by Polden
6. Saunders Manual of Physical Therapy Practice

CARDIO-RESPIRATORY DISORDERS & SURGERY

PHYSIOTHERAPY IN CARDIO-RESPIRATORY DISORDERS & INTENSIVE CARE MANAGEMENT

6. The Brompton Guide to chest Physiotherapy DU Gasket [Completed]
7. Cardiopulmonary Physical Therapy: a guide to practice- Irwin S, Techlin JS
8. Essentials of Cardiopulmonary Physical Therapy- Hillegass, Ellen
9. Essentials of Cardio Pulmonary Physical Therapy by Hillegass and Sadowsky
10. Physical Rehabilitation Assessment and Treatment – O’Sullivan Schmitz
11. Elements in Paediatric Physiotherapy – Pamela M Eckersley

COMMUNITY MEDICINE

1. Textbook of preventive & Social Med – Gupta & Mahajan

RESEARCH METHODOLOGY AND BIostatISTICS

5. Elementary Statistics 1st Edn, 1990. in Medical Workers by Inderbir Singh
6. Statistics in Psychology and education by Great and Henry
7. An Introduction to Gupta C.B. Statistical Methods, 1972 by Ram Prasad & Sons
8. Basic Statistics, 3rd Edn by Simpsory G. Kaftha. P
9. Research; Principles and Methods by L Denise F. Poli & Hungler
10. Fundamentals of Research, 4th Edn. By David J. fox

ETHICS & MANAGEMENT

3. Health Services Management, Analysis & Application, Wadsworth Publishing Company, Belmont
4. Davies, R and Macaulay, BMC – Hospital Planning and Administration
5. George V Lobo – Current Problems in Medical Ethics
6. Consumer Protection Act – 1986, Government of India, New Delhi.
7. Francis C M – Hospital Administration

NEUROLOGY AND NEURO SURGERY

4. Davidson: Principle and practice in medicine

5. John Walton: Brains Diseases of the nervous system
6. Baily & Love: Short practice of surgery
7. Hutchisons clinical methods.

PHYSIOTHERAPY IN NEUROLOGY & NEURO SURGERY

7. Braddom – Physical medicine & rehabilitation
8. Swaner – Brunnstorms movement therapy
9. Robbert Carr & Shapperd – Motor relearning Programme
10. Robbert Carr & Shapperd- Neurological rehabilitation
11. Ecker- Elements of pediatric Physiotherapy
12. Barbara- Physiotherapy for cerebral palsy children.
13. Adal Cuningg – Key Issues in neurological Physiotherapy.
14. Physical management in neurological rehabilitation- Stokes M
15. Physical Therapy for Children- Campbell SK, Palisano RJ, Orlin M
16. Motor Control: Theory and Practical Applications- Anne Shumway-Cook, Marjorie H. Woollacott
17. Differential Diagnosis for Physical Therapists-Goodman & Snyder

ORTHOPEDECS & SPORTS MEDICINE

4. Outline of Fractures—John Crawford Adams.
5. Outline of Orthopedics.— John Crawford Adams.

PHYSIOTHERAPY IN ORTHOPEDECS & SPORTS

6. Management of Common Musculoskeletal Disorders- Hertling D, Kessler RM
7. Physical Rehabilitation Assessment and Treatment – O’Sullivan Schmitz
8. Sports Physiotherapy- Maria Zuluaga
9. Differential Diagnosis for Physical Therapists-Goodman & Snyder

PHYSIOTHERAPY IN COMMUNITY HEALTH

2. ACSM (set of 3 books)
3. Legal Rights of Disabled – RCI
4. Textbook of Work Physiology – Astrand

5. Exercise Physiology - Mc Ardle
6. Ergonomics: Man in working environment – Mural
7. Occupational injuries – Herrington
8. Musculoskeletal disorders in the work place – Nordin
9. Exercise testing & Exercise prescription for special cases - J. Skinner
10. Sports Injuries - Zuluaga
11. Rehab Medicine-Part I/II – Delisa
12. Rehabilitation Medicine by Howard A Rusk.
13. Rehabilitation Medicine by Joel A De lisa
14. Text book of O.T – Pedretti
15. Normal Human Locomotion - Published by ALIMCO
16. Atlas of Prosthetics and Orthotics - ALIMCO

2.20 Journals

1. Journal of Physical Therapy
2. Physiotherapy
3. Australian Journal of Physiotherapy
4. Indian Journal of Physiotherapy

2.21 Logbook

Every student shall maintain a record of skills (Log book) he/she has acquired during each year of training period certified by the various heads of the department where he/she has undergone training. The Head of the department shall scrutinize the log book once in every three months. At the end of each year, the candidate should summarize the contents and get the log book certified by the Head of the Institution.

3. Examinations

3.1 Eligibility to appear for exams

There shall be 80% attendance in theory and practical/clinical to appear for the University examination as specified in the respective course regulations. Condonation of shortage of attendance on genuine grounds, for subject/subjects (in theory or in practical or both) up to a maximum of 10% can be granted once during the entire course period. The Principals/ Heads of Institutions are empowered for granting condonation for shortage of attendance on recommendation by Head(s) of the Department under intimation to KUHS with the prescribed fee.

The candidate must secure the minimum marks of 50% in internal assessment in theory/ or practical in a particular subject as per the course regulations in order to be eligible to appear in the university examination of the subject.

3.2 Schedule of Regular/Supplementary exams

There will be two examinations in a year (regular and supplementary), to be conducted as per notification issued by university from time to time. First, second, third and final Examinations of the BPT course shall be held at the end of first year, second year, third year and fourth year respectively. Supplementary examination shall be conducted by the university for the benefit of unsuccessful candidates. The supplementary examination shall be conducted within six months from the date of announcement of results.

3.3 Scheme of examination showing maximum marks and minimum marks

I Year BPT

S No.	Subject	Duration	Theory				Practical			Total
			Written	Viva-Voice	IA	Total	Practical	IA	Total	
01	Anatomy	3 Hrs	100/50	50	50/25	200/100	80/40	20/10	100/50	300/150

02	Physiology	3 Hrs	100/50	50	50/25	200/100	80/40	20/10	100/50	300/150
03	Biomechanics & Kinesiology	3 Hrs	100/50	-	50/25	150/75	-	-	-	150/75
04	Section-A Psychology	3 Hrs	50	-	25	75	-	-	-	150/75
	Section-B Sociology		50	-	25	75	-	-	-	
	Total		100/50	-	50/25	150/75	-	-	-	

II Year BPT

S N o.	Subject	Durati on	Theory				Practical			Total
			Writte n	Viva - Voc e	I A	Total	Practic al	I A	Total	
01	Electrotherap y	3 Hrs	100/50	50	50/25	200/100	80/40	20/10	100/50	300/150
02	Exercise Therapy	3 Hrs	100/50	50	50/25	200/100	80/40	20/10	100/50	300/150
03	Pharmacolog y	3 Hrs	80/40	-	20/10	100/50	-	-	-	100/50
04	Section-A Pathology	3 Hrs	50	-	25	75	-	-	-	150/75
	Section-B Microbiology		50	-	25	75	-	-	-	
	Total		100/50	-	50/25	150/75	-	-	-	

III Year BPT

S No.	Subject	Duration	Theory				Practical			Total
			Written	Viva-Voce	IA	Total	Practical	IA	Total	
01	General Medicine & General Surgery	3 Hrs	100/50	-	50/25	150/75	-	-	-	150/75
02	Physiotherapy in General Medicine & General Surgery	3 Hrs	100/50	50	50/25	200/100	80/40	20/10	100/50	300/150
03	Cardio respiratory disorders and surgery	3 Hrs	100/50	-	50/25	150/75	-	-	-	150/75
04	Physiotherapy in Cardio respiratory and Intensive care management	3 Hrs	100/50	50	50/25	200/100	80/40	20/10	100/50	300/150
05	Community Medicine	3 Hrs	100/50	-	50/25	150/75	-	-	-	150/75

IV Year BPT

S No	Subject	Duration	Theory				Practical			Total
			Written	Viva - Voce	I A	Total	Practical	I A	Total	
01	Neurology & Neurosurgery	3 Hrs	100/50	-	50/25	150/75	-	-	-	150/75
02	Physiotherapy in Neurology & Neurosurgery	3 Hrs	100/50	50	50/25	200/100	80/40	20/10	100/50	300/150
03	Orthopedics & Sports Medicine	3 Hrs	100/50	-	50/25	150/75	-	-	-	150/75
04	Physiotherapy in Orthopedics & Sports	3 Hrs	100/50	50	50/25	200/100	80/40	20/10	100/50	300/150
05	Physiotherapy in Community Health & Project	3 Hrs	100/50	50	50/25	200/100	80/40	20/10	100/50	300/150

3.4 Papers in each year

As in 3.3

3.5 Details of theory exams

Question paper pattern for BPT theory examination

Subjects having maximum marks = 100		
Type of question	Number of questions	Marks for each question
Structured Essays	2	15
Brief structured essay	4	10
Short Answers	10	3

Subjects having maximum marks = 80		
Type of question	Number of questions	Marks for each question
Structured Essays	2	15
Brief structured essay	2	10
Short Answers	10	3

Subjects having maximum marks = 50		
Type of question	Number of questions	Marks for each question
Structured Essays	1	15
Brief structured essay	2	10
Short Answers	5	3

In the subject Anatomy - Essay Questions should be from the Upper limb and Lower limb, and from the basic Neuro Anatomy, Cardio vascular & Respiratory System.

In the subject Physiology - Essay Questions should be from Musculoskeletal, Nervous system, Respiratory System, Cardio vascular System and Exercise physiology.

In Sociology & Psychology, Pathology, Microbiology, Pharmacology and all Clinical Subjects - Essay Questions should be from areas relevant to practice of Physiotherapy.

BROAD GUIDELINES

Structured Essay should be explanatory. Brief structured Essay should be descriptive and short answers should be based on direct recollection.

3.6 Model question paper for each subject with question paper pattern

Annexure - I

3.7 Internal assessment component

- a. There shall be a minimum of 3 periodic assessments, for theory and practical including viva separately, of which the final one shall be in the KUHS pattern and is mandatory.
- b. Average of the marks of the KUHS pattern examination and the best out of the remaining periodical assessments shall be taken as internal assessment mark of the candidate
- c. The class average of internal assessments mark of theory and practical should not exceed 75% of Maximum marks
- d. The class average of internal assessment for an examination shall be calculated based on the total number of candidates in a particular batch appearing for that internal assessment examination.
- e. The candidate must secure the minimum marks of 50% for internal assessment in theory, practical and viva voce in a particular subject order to be eligible to appear in the university examination of the subject.

3.8 Details of practical/clinical practical exams

Type of Question	Maximum Marks
Two Long Case (40 Marks each)	80
Viva	50

3.9 Number of examiners (Internal & External) and their qualifications

There will be two examiners for each subject where practical/ or viva to be conducted. One examiner (INTERNAL EXAMINER) is preferably from the same institution or as decided by the KUHS and the other examiner will be from another zone of KUHS (EXTERNAL EXAMINER). The examiners should have at least 3 years of teaching experience after post graduation.

3.10 Details of viva:

Wherever viva is prescribed the same will be conducted by the internal and external examiners appointed for practical examinations.

4. NTERNSHIP

4.1 Eligibility for internship

A candidate becomes eligible for internship only after successfully passing all the examinations prescribed by KUHS including internal examinations conducted for subsidiary subjects.

4.2 Details of Internship Training

Every candidate admitted BPT degree course shall undergo 180 days of compulsory rotating internship after passing of the final year examinations. No candidate shall be awarded degree certificate without successfully completing six months of internship.

The internship should be rotated essentially involving posting to Physiotherapy Out-patient department, and Community Physiotherapy. It should cover clinical branches concerned with Physiotherapy such as Orthopaedics and sports, Cardio respiratory, neurology and neurosurgery, paediatrics, general medicine, general surgery, OBG and respective ICU & Prosthetics and orthotics.

4.3 Model of Internship Mark lists

Marks will be awarded for regularity, punctuality, responsibility, dedication, subject knowledge, assessment and treatment skills, interpersonal relationship, leadership skills and ability to function in a multi specialty team.

4.4 Extension rules

The interns will be allowed to take leave as per KUHS regulations. However, the candidate should undergo minimum of 180 days of internship. Extension will be applicable for the period of absence.

4.5 Details of training given

The internship should be rotating, essentially involving posting to departments which refer in and out patients for physiotherapy care. It includes Physiotherapy Out-patient department, Community Physiotherapy, Orthopaedics and sports medicine, rheumatology, cardio respiratory medicine and surgery, various ICU's, neurology and neurosurgery, paediatrics, general medicine, general surgery, OBG, burns and dermatology, geriatrics and prosthetics and orthotics.

The candidate should carry out assessment, treatment planning, and implementation of treatment, reassessment, and follow up. The candidate should also take part in journal presentation, case presentation, and seminars as per the institutional guidelines is mandatory.

For successful completion, the student must maintain a log book. On completion of each posting the same will have to be certified by the faculty in-charge of the posting for both

attendance as well as work done. On completion of all postings, the duly completed log book will be submitted to the Principal / Head of the Institution to be considered as having successfully completed the internship program.

5. ANNEXURES

5.1 Check Lists for Monitoring: Log Book, Seminar, Assessment etc. to be formulated by the curriculum committee of the concerned Institution

5.2 Qualification for Teachers and Examiners in BPT course.

The teachers and examiners should possess qualifications acquired from a University / Institution recognized by K.U.H.S. The teachers should possess post graduate degree from a university recognized by KUHS. To become external/internal examiner a teacher should possess a minimum of three years of post P.G teaching experience in the concerned subject. The following are the faculty qualifications for teaching and becoming and Examiner.

S. No.	Subject	Qualification
01	Anatomy	M D/ M Sc Anatomy/MPT
02	Physiology	M D/M Sc Physiology/MPT
03	Biomechanics & Kinesiology	MPT
04	Psychology	M A Psychology/MPT
05	Sociology	M A Sociology/MPT
06	Pathology	M D Pathology/MPT/MMLT
07	Microbiology	M D/ M Sc Microbiology /MPT
08	Pharmacology	M Pharm / MD Pharmacology /MPT

09	Electrotherapy	MPT
10	Exercise Therapy	MPT
11	General Medicine and general surgery	MD/ MPT
12	Physiotherapy in General Medicine & General Surgery	MPT
13	Cardio respiratory disorders and surgery	DM Cardiology/ DM Pulmonology/ MCh Cardio thoracic Surgery / MPT (Cardio Resp)
14	Cardio respiratory and Intensive care Physiotherapy	MPT (Cardio Resp)
15	Community Medicine	MD (Com Med)/MPT
16	Ethics and Management	MPT
17	Neurology & Neuro surgery	DM Neurology / MCh Neurosurgery / MPT (Neuro)
18	Physiotherapy in Neurology & Neuro surgery	MPT (Neuro)
19	Orthopaedics and Sports Medicine	M S Orthopaedics / D. Ortho / MPT (Ortho & Sports)
20	Orthopaedics and Sports Physiotherapy	MPT (Ortho & Sports)
21	Physiotherapy in Community Health	MPT

Question Paper setting and evaluation

Question Paper setting and evaluation for all papers in BPT course should be done by concerned subject experts with 3 year post PG experience OR MPT degree holders with minimum 3 years post P.G teaching experience in the concerned subject.

Syllabus

for Courses affiliated to the
Kerala University of Health Sciences

Thrissur 680596



BACHELOR OF SCIENCE IN MEDICAL LABORATORY TECHNOLOGY

Course Code: 012

(2016-17 Academic year onwards)

2. COURSE CONTENT

2.1 Title of course:

Name of the course shall be the “BACHELOR OF SCIENCE IN MEDICAL LABORATORY TECHNOLOGY” – BSc (MLT)

2.2. Objectives of course

At the end of the course the candidates shall be:

1. Aware of the principle underlying the organization of a clinical laboratory.
2. Able to do routine and special investigative procedures in medical laboratory practice.
3. Provide a good theoretical and practical education who plan to work with in the field of medical laboratory technology and science.
4. Develop knowledge and skill in accordance with the society's demand in medical Laboratory technology.
5. Qualify the students for official approval as medical laboratory technologist.
6. Able to operate and maintain all equipment used in laboratory diagnostics.
7. Able to establish and manage a clinical or Research laboratory.

2.3. Medium of instruction:

Medium of instruction shall be English

2.4. Course outline

The course of study enhances student's knowledge and skills in several major categorical areas of medical laboratory technology. The degree in medical laboratory technology provides advanced skills to practicing laboratory professionals in health administration, leadership, quality assurance and health informatics. It is a four year professional Degree course comprising four papers in each year. Total course duration is 5860 hours including 100 hours of training in reputed external Hospitals/institutes. There will be three internal examinations conducted by the Institutes/Colleges and one public examination at the end of each academic year.

2.5. Duration

Duration of the course shall be four academic years with University theory and practical examination in each year. The students should undergo training for at least 2 weeks in one or more national reputed institutions during the period of the course especially for Virology, Mycology and recent advances in Medical technology.

Maximum time span for acquiring the degree will be 8 years from the joining of the course. (Double the normal course duration)

2.6. Subjects

As given under “Content of each subject in each year “

2.7. Total number of hours

The students have to attend a minimum of 240 working days. Total course duration is 5860 hours including 100 hours of training in reputed external Hospitals/institutes.

The concept of health care counseling shall be incorporated in all relevant areas.

2.8. Branches if any with definition:

a) Branches of study

The course shall comprise of both theory and practical studies in different branches of Medical laboratory technology and its related subjects such as

1. Anatomy
2. Physiology
3. Medical Laboratory Science and Ethics
4. Biochemistry
5. General Microbiology
6. Immunology
7. Mycology
8. Virology
9. Applied Microbiology
10. Parasitology
11. Entomology
12. Systemic Diagnostic Bacteriology
13. Transfusion technology
14. General and Clinical Pathology
15. Hematology
16. Cytology
17. Histopathology techniques
18. Cytogenetic
19. Molecular biology
20. Research methodology and Biostatistics
21. Computer applications
22. Laboratory managements.

2.9. Teaching learning methods:

- Lecture and practical classes
- Regular clinical Laboratory posting to pick up practical skill and practice techniques on diagnostic investigations, laboratory responsibility and supervision.

- Students should present seminars in various clinical subjects in medical laboratory technology to attain presentation skill.

a) Title of subjects & hours of study

Subject		Total Hours/subject/year			
		Theory	Practical	Clinical Lab Posting	Total
First Year					
Paper-I	I A Anatomy	100	80	-	180
	I B Physiology	115	65	-	180
Paper-II	Biochemistry-I	130	230	-	360
Paper III	Basic Microbiology & Immunology	130	230	-	360
Paper IV	Basic Medical Laboratory Science & Haematology – I	130	230		360
Second year					
Paper V	Biochemistry II	90	174	96	360
Paper VI	General Microbiology	90	174	96	360
Paper VII	Parasitology & Entomology	90	174	96	360
Paper VIII	Haematology-II& Clinical Pathology	90	174	96	360
Third year					
Paper IX	Biochemistry III	100	200	150	450
Paper X	Bacteriology	100	200	150	450
Paper XI	Cytology and Transfusion technology	100	200	150	450
Paper XII	Computer Application, Research methodology, Biostatistics & Laboratory management	90	--	--	90
Final year					
Paper XIII	Biochemistry IV	90	180	160	430
Paper XIV	Mycology, Virology and Applied Microbiology	90	180	160	430
Paper XV	Histotechnology and Cytogenetics	90	180	160	430
Paper XVI	Project	150			150
	**Training at reputed external Hospitals/ National Institutions				100
Grand Total					5860

b) Qualification of Teacher

The Minimum qualification for a teacher is the Acquisition of MBBS and MD in Biochemistry/Pathology /Microbiology or Four year BSc.MLT Degree and Masters Degree in MLT (MSc MLT) in Biochemistry/Pathology / Microbiology

from any Institute or Medical College and approved by the Kerala University of Health Sciences and Govt. of Kerala.

2.10. Content of each subject in each year

FIRST YEAR

Paper I - Anatomy & Physiology

Paper I A - ANATOMY - Theory -100Hours & Practical-80 hr

Paper I B- Physiology – 115 Hours & Practical 65 hrs

Paper I A – ANATOMY INCLUDING HISTOLOGY- Theory -100 Hours& Practical-80 hr

Course Description: The Course is designed to enable students to acquire General knowledge of the normal structure of various human body systems and more emphasis given to those relevant for Medical Laboratory Technology students. The Course content is divided into 3 categories; must know, desirable to know and nice to know, which is indicated as must know (***) , desirable to know (**) and nice to know (*). A maximum of 60% of questions for the University examination should be from must know portions of the content, 30% may be from desirable to know portions of content and a maximum of 10% of questions from Nice to know content for university examination. There will be no University practical and viva examination for Paper –I Anatomy & Physiology and also no practical internal assessment. But practical classes should be conducted as per the Hour distributed for the same.

Anatomy including Histology Topics

- 1) Introduction to Anatomical terms organization of the human body.
 - a) Microscopic structure of Human cell **
 - b) Classification, functions and Microscopic Structures of Primary tissues , Epithelial tissue, connective, tissue, muscular tissue, Nervous tissue
(With Histology) **
 - c) **Histology** of Cartilage – Hyaline, Elastic, fibro cartilage **
- 2) **The Skeletal System**
 - a) Classification of bones, constituents of bone and bone tissue. Functions of Skeleton, Microscopic Structure of compact bones.**
 - b) **Histology:** Bone cross section and longitudinal section *
 - c) Organizations of skeleton, Structure of typical vertebrae. *
 - d) Brief study on individual bones: Axial skeleton, appendicular skeleton, cartilages and its classifications.*
 - e) Scapula, Humerus, Radius & ulna, Sacrum, Clavicle, Hip bones, pelvic bones, femur, tibia, fibula*
 - f) Carpel and tarsal bones. *

- g) Classification of joints**, movements*, with examples type of ligament *
- h) Skull bones - Importance of sutures: coronal, sagittal and lamboid, cranial fossae, foramen magnum (elementary knowledge only). Bones of Cranium, Auditory meatus, Mandible and Ramus.*
- i) Difference between foetal and adult skull. **
- 3) Muscular System**
- a) General function and actions of Nerve supply and blood supply of muscles*. Classification of muscles*. Diaphragm. *
- b) Nerve supply and blood supply of hands and legs. ***
- c) **Histology** of Muscle, voluntary or striated, cardiac muscle, Smooth muscle or plane muscle. **
- 4) Thorax**
- a) Thoracic cavity***, Mediastinum***, Pleura ***
- 5) Respiratory System**
- a) Trachea and lungs – Position, relation, structure***, and blood supply*. Broncho-pulmonary segments. Bronchiole, alveoli and muscles of respiration. **
- b) **Histology** of Trachea and lungs***
- 6) Heart**
- a) Position, shape, size, structure, borders, chambers of heart, valves, pericardium***, blood supply* and nerve supply of heart*,
- b) Conducting system of heart**. Arterio-ventricular node. **
- 7) Vascular system**
- a) Blood vessels, classification and its structure***
- b) Differences in the structure of artery and vein. Portal venous system. ***
- c) **Histology:** Large artery – Aorta, Medium sized artery, Large veins – Inferior vena cava, Medium sized vein**
- 8) Lymphatic System**
- a) Lymph node, spleen, thymus, tonsil, lymphatic duct. **(With Histology)** ***
- 9) Digestive System**
- a) Oral cavity, salivary glands, teeth, tongue, pharynx, esophagus, stomach ***
- b) Glands in digestive system, small intestine - duodenum, jejunum, ileum***.
- c) Pancreas, liver, gall bladder, gall stone, biliary tract. Large intestine, colon, appendix, rectum-recto-vesical and recto-uterine pouch **(With detailed Histological approach)** ***.
- 10) Urinary System**
- a) Kidney, nephron***, ureter, urinary bladder and its relation in male and females, urethra. **(With detailed Histological approach)** ***, blood supply**, venous drainage**,
- 11) Reproductive system**
- a) Male reproductive system*** – testis, seminiferous tubules, epididymis, seminal vesicles, external genitalia of male. **(With Histology)*****
- b) Female reproductive system – vagina, cervix, uterus, fallopian tubes, ovary, ovarian follicles **(With Histology)**. ***

- 12) **Nervous System**
- Classification and structure of neurons, brain - parts, ventricles, cranial nerves, spinal cord, spinal nerves. **(with Histology)****
 - Histology** of Neuron, Spinal ganglion, Sympathetic ganglion. Nerve Fibre – Optic nerve, Sciatic nerve **
- 13) **Integumentary system.**
- Skin - parts, function. **(Histology)****
- 14) **Endocrine system.**
- Pituitary glands, thyroid, parathyroid, suprarenal gland. ***
 - Histology** of Pituitary, Thyroid & parathyroid, Adrenal gland and Pancreas. ***
- 15) **Special senses**
- Olfactory epithelium, taste buds of tongue. **
 - Structure of ear, eye; functions. **

Practical***

80 hours.

Demonstration of gross anatomy – organs

Demonstration of Veins, arteries and nerves in the hands and legs

Demonstration of bones

Identification of normal tissues

Human skeleton-parts demonstration

Preparation of histology slides

Microscopic demonstration and identification of histology slides as per theory. Museum jars, Preparation & Demonstration.

Visit an Anatomy museum

Text Books

- Gross Anatomy - Chaurasia vol 1,2,3
- Histology - I. B .Singh's text book.
- General Anatomy - Chaurasia.

Paper I B- Physiology – 115 Hours & Practical 65 hrs

Course Description: The Course is designed to enable the students to acquire knowledge of the normal physiology of various human body systems and understand the alterations in physiology in diseases and apply this. More emphasis shall be given to those relevant for medical Laboratory Technology students .The Course content is divided in to 3 categories; **must know, desirable to know and nice to know**, which is indicated as must know (***) , desirable to know (**) and nice to know (*). A maximum of 60% of questions for the University examination should be from must know portions of the content, 30%

may be from desirable to know portions of content and a maximum of 10% of questions from Nice to know content for university examination. There will be no University practical and viva examination for Paper – I B - Physiology and also no practical internal assessment. But practical classes should be conducted as per the Hour distributed for the same.

Topics

- 1) **Introduction to physiology**
Homeostasis ***
- 2) **Blood physiology**
 - a) Composition and functions of blood***
 - b) Plasma proteins – types, functions ***
 - c) RBCs – morphology, functions, erythropoiesis***
 - d) WBCs – classification, morphology, functions, WBC count, leucopoiesis***
 - e) Platelets – normal count, thrombopoiesis***
 - f) PCV, ESR, osmotic fragility, RBC count, blood indices – MCH, MCV, MCHC**
 - g) Hemostasis – mechanism***
Coagulation of blood – extrinsic and intrinsic pathway***
 - h) Bleeding time, clotting time***
 - i) Blood groups – ABO system, determination, importance, mismatch blood transfusion, Rh system***
- 3) **Respiratory system**
 - a) Functional anatomy – phases of respiration – inspiration and expiration – mechanism**
 - b) Lung volumes and capacities – values**
 - c) Spirometry*
 - d) Pulmonary gas exchange – diffusion of gases, transport of respiratory gases in blood – O₂ and CO₂***
 - e) O₂ – Hb dissociation curve***
 - f) Regulation of respiration – chemical and neural***
- 4) **Cardiovascular system**
 - a) Functional Anatomy, Conducting system and spread of cardiac impulse Cardiac cycle – definition, duration of phases. ***
 - b) Heart sounds, Pulse – Definition, Heart rate, Systemic circulation**
 - c) ECG – Basic principle of recording, types of leads – Normal ECG**
 - d) Cardiac output – definition**
 - e) Determination of blood pressure and normal values, regulation, determination of BP in man. ***
- 5) **Endocrine system**
 - a) General introduction, Hormones – definition***
 - b) Endocrine glands – names, their secretions, major functions, (hypothalamus, pituitary, thyroid, parathyroid, pancreas, adrenal glands, ovary and testis). ***
- 6) **Muscle and nerve**
 - a) Transport across cell membrane, Resting membrane potential and its bands Action potential – its basis, refractory period, latent period. ***
 - b) Neuron – Morphology, properties ***

- c) Muscle – Types, difference between them, properties. **
 - d) Neuromuscular junction, structure, neuromuscular transmission. **
- 7) Nervous system**
- a) Introduction, organization of brain and spinal cord, functions. ***
 - b) Synapse – definition, types, synaptic transmission and synaptic inhibition. **
 - c) Reflex action – definition, components, important properties, importance **
 - d) Cerebral cortex – Gross structure importance, EEG, Cerebellum – Gross structure, functions, Hypothalamus – functions**
 - e) Thalamus – functions, Basal ganglia – functions**
 - f) Autonomic nerves system**
 - g) CSF –Production, circulation, composition, functions***
 - h) Lumbar puncture. **
- 8) Special senses**
- a) Vision – Basic optics. Briefly on refractory errors of eyes, Visual receptors, visual pathway**
 - b) Audition –Functional anatomy, Functions of ear**
 - c) Olfaction, Gestation**
- 9) Digestive system**
- a) Functional Anatomy – Innervations, Salivary secretion***
 - b) Gastric secretion – phases, control, Gastric – functions; Pancreatic secretion – functions, regulation; Liver – functional anatomy, Bile – functions and composition***
 - c) Small intestine – secretion, GI motility-Deglutition, Peristalsis; Functions of stomach, small intestine and colon. ***
- 10) Excretory system**
1. Renal system***
 - a) Kidney - Functional anatomy of kidney, Functions of kidney***
 - b) Urine formation – glomerular ultra filtration, tubular reabsorption, tubular secretion***
 - c) Glomerular filtration rate – definition, measurement, factors affecting. ***
 - d) Tubular functions – re-absorption of sodium, water, glucose, tubular secretion of H⁺ (Acidification of urine) **
 - e) Diuresis and diuretics, micturition**
 - f) Dialysis**
 2. Skin
 - Mechanism of temperature regulation**.
- 11) Reproductive system**
- a) Sex determination, Role of hormones in sexual differentiation in fetal life**
 - b) Male reproductive system – organs, functions of testis; Female reproductive system – functions of ovaries***
 - c) Menstrual cycle – ovarian cycle and uterine cycle***
 - d) Fertilization, pregnancy, functions of placenta, Parturition, Pregnancy test principle***

Practical* 65 Hours**

1. Haemoglobin estimation
2. ESR determination
3. RBC count
4. WBC count
5. Differential count
6. PCV, Red cell indices.
7. Osmotic fragility test
8. Bleeding time, Clotting time
9. Blood grouping
10. Measurement of Blood pressure in man

Text Books

1. Essentials of Medical Physiology - K. Sembulingam & Prema Sembulingam.
2. Text book of physiology for BDS students - Prof. Jain A.R.
3. Text book of physiology - choudhary
4. Text book of physiology - Ganong
5. Text book of physiology - G.K.Pal.

Paper II Biochemistry I – 130 hours

Topic

Introduction to the Chemistry of the LIVING THINGS AND CELL.

- Cell structure, cell organelles and bio membrane –structure and function, cell fraction
- Units of measurements

Laboratory glass wares. Glass - composition, properties, varieties, grades of glassware's. Advantages and disadvantages of various disposable lab ware.

- Cleaning of laboratory glass wares. Preparation of cleaning solutions. Care of laboratory wares and utensils.
- Grades of chemicals, storage and handling of chemicals and reagents.
- Laboratory safety - General principles, laboratory hazards and safety measures, universal safety precautions.
- First aid in the laboratory
- Expressing concentrations of solutions in Physical Unit and in Chemical Units
- Water the universal solvent, Ionization of Water, weak acids and weak bases, dissociation constants, buffer systems, Henderson Hasselbach equation, PH and PH meter.
- Method of measuring liquids and weighing solids, care of single pan balance, analytical balance, electrical and electronic balance.
- Calibration of pipette and other volumetric apparatus.
- Primary standard chemicals and secondary standard chemicals. Volumetric analysis-

preparation of normal solutions, percentage solutions, molal solutions, molar solutions. Preparation of standard solutions of Oxalic acid, Sodium hydroxide, Hydrochloric acid, Sulphuric acids, Silver nitrate and Potassium permanganate.

- Dilution of solution. Inter conversion of concentration - Normal, Molar, Molal and Percentage solution. Preparation of reagents for various biochemical analysis,
- chemical indicators and theory of indicators.
- Collection, preservation and processing of biological specimens for biochemical analysis, preparation and use of anticoagulants and urine preservatives.
- Preparation and storage of distilled water, double distilled and deionised water. Evaluation of water purity.
- Colorimetric analysis, spectrum of light, monochromatic light, polychromatic light, absorption and transmission of light. Principle of colorimetric analysis, selection of filters, Colorimetry, spectrophotometry, Fluorimetry, Atomic Absorption Spectrophotometry, nephelometry, Flame photometry etc
- Radio-Isotopes, basic principles of radioactivity, detection and measurements of radioactivity and applications .
- General laboratory equipment-Principle, use and maintenance of the following, instruments / apparatus - centrifuge, cold centrifuge, homogenizer, desiccators, vortex mixer, magnetic stirrer.
- Viscosity, surface tension, properties of colloids, emulsions, adsorption, partition coefficient and its application to biological systems.
- Osmosis, dialysis and Donnan membrane equilibrium.

CHEMISTRY OF BIOLOGICAL MOLECULES

CARBOHYDRATES

- Classification, chemistry and properties of monosaccharide, disaccharides and polysaccharides. Stereoisomers, epimers, and reactions of monosaccharide and other carbohydrates. Digestion and absorption of carbohydrates. Mucopolysaccharides and glycoproteins.

PROTEINS

- Classification, properties and biological function,
- AMINO ACIDS Structure & properties- peptide bond, primary, secondary, tertiary and quaternary structures, sequence analysis.
- Digestion and absorption of proteins.
- Lipo proteins and nucleo proteins, structural proteins.
- Colour reactions of amino acids and proteins

LIPIDS

- Classification of lipids, chemistry and properties of fatty acids - saturated, & unsaturated fatty acids, triglycerides, phospholipids and steroids.
- Saponification number, Iodine number and rancidity. Digestion and absorption of lipids,
- Cell membrane: Structure and function – fluid Mosaic model and, transport mechanisms.

NUCLEIC ACIDS

- Chemistry of purines, pyrimidines, nucleosides, nucleotides, nucleic acids, nucleosomes. Structure of DNA and RNA.

- ☐ Measurements of liquids, Weighing solids
- ☐ Calibration of pipette and other volumetric glass wares
- ☐ Preparation of saturated solution and half saturated solutions
- ☐ Preparation of standard solutions, % solutions (V/V. W/V normal and molar solutions.
- ☐ Preparation of buffers: acetate ,phosphate and tris buffers and measurement of pH
- ☐ Cleaning of lab wares and laboratory utensils, preparation of cleaning fluids.
- ☐ Preparation of distilled and deionised water
- ☐ Preparation of anticoagulants and preservatives for specimen collection.
- ☐ Use and proper maintenance of -Analytical balance, Electronic balance, Centrifuge, Colorimeter, spectrophotometer, pH meter, Homogenizer, Desiccators
- ☐ Measurement of pH, preparation of buffers
- ☐ Titration of acids and bases, preparation of standard solution of Sodium hydroxide, Hydrochloric acid, sulphuric acid. Silver nitrate and Potassium permanganate solutions
- ☐ Reactions of carbohydrates, reactions of glucose, fructose, maltose, lactose, sucrose, dextrin, starch and glycogen.
- ☐ Reactions of Amino acids, colour reactions of albumin, globulin, casein, gelatin and peptone.
- ☐ Reactions of fatty acids and cholesterol
- ☐ Reactions of NPN substances (urea, uric acid, creatinine)

RECOMMENDED TEXT BOOKS

1. An Introduction to medical laboratory y technology - Baker - P Silvertten.
2. Harper's Biochemistry - Robert K. Murray
3. Text Book of Biochemistry - Vasudevan and Sreekumari.
4. Medical Laboratory Technology - Kanai. L. Mukharjee

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**FIRST
YEAR**

Paper III. BASIC MICROBIOLOGY & IMMUNOLOGY - 130 hours

Topic

BASIC MICROBIOLOGY – 55 hours

1. Introduction to Microbiology

Historical review (Contributions of E. Jenner, L. Pastuer, Robert Koch and postulates, Anton van Leeuwenhoek, Alexander Fleming) and scope of microbiology. Role of medical microbiology in diagnosis and control of infections.

2. Sterilization and disinfection

Definitions of sterilization, disinfection, antiseptics.

Classification of sterilization and disinfection. Different methods of sterilization:

Heat, radiation, filtration, chemical methods (Emphasis should be given to each method)

Selection of material for sterilization or disinfection

3. Sterilization –Physical methods and chemical methods

Autoclaves -Different types, principles, operating procedures, precautions, applications and quality control

Disinfection-Physical methods and Chemical methods

4. Filtration

Methods, principles, types of filter, applications

5. Radiation

Principles, methods, applications

6. Chemical methods

Factors influencing the performance of the chemical disinfectants.

-Sporicidal disinfection.

-Different types of chemical agents used for disinfection.

-Emphasis should be given to its mode of action,

-MIC, its period of exposure, application and limitations.

-Quality control tests for each method,

-Decimal reduction time (D Value).

7. Testing of disinfectants

In use test, Rideal – Walker test or Chick – Martin test

(Students should know the sterilization or disinfection of the following – floors, work benches, safety cabinets, rooms, operation theatres, skin, hospital wares, and laboratory. Equipment. Theatre instruments, different types of media, plastic materials, cotton materials, instruments used in surgery etc.)

- Preparation of disinfectant for laboratory use.

- Decontamination of equipments and wastes especially in microbiology.

- Washing, cleaning, packing and sterilization of glasses and storage of sterile articles.

- Classification of microbes on the basis of hazards.

- Principles of classifications of laboratory safety cabinet and its applications

8. Incubators

Design, different models, working principles, precautions, calibration of temperature.

Anaerobic incubators, Walk in incubator –principles and its applications

9. Cell morphology

Prokaryotic and Eukaryotic cell – structure and function

10. Morphology of bacteria

- Anatomy of the bacterial cell. (Special emphasis should give to cell wall, capsules, flagella, plasmid, bacterial spores, spheroplasts, protoplasts, L–forms)

11. Staining

Definition of stain. Acidophilic, Basophilic and Neutral stains. Preparation of smears, its fixation and uses. Principles, preparation of reagents, procedures, modification. Uses, advantages and disadvantages of the following staining methods.

- Simple staining
- Differential staining(Gram’s staining, A.F.B. staining)
- Negative staining
- Fluor chrome staining
- Staining of volutin granules
- Staining of spirochetes
- Special stains for spores, Capsules, Flagella
- Quality control in staining

IMMUNOLOGY - 75 hours

- Definitions of infection, Pathogenicity, Virulence, Primary infection, nosocomial infection
- Description of different sources of infection and how they are transmitted to others.
- A brief introduction of different predisposing factors responsible for bacterial infection.
- Structure and function of Immune system
- An introduction to immunity and immune system, classification of immunity
- Descriptive study of Innate immunity and its determinants
- A descriptive study of Acquired Immunity
- Classification of Acquired Immunity with its detailed description

- Immune responses
- Principles of cell mediated and humoral immunity
- Discussion on cellular immune responses (more emphasis should be given for lymphokines or cytokines, TNF, Interferon)
- Lymphocytes subsets and its functions, Natural killer cells.
- Antigens and their properties, Super Antigens, Heterophile Antigens.
- Immunoglobulin and their structure and functions.
- Monoclonal antibody
- Major Histocompatibility complex – a brief description of gene organization, structure and its functions, transplantation.
- A brief description of complement and its properties
- Activation and regulation of complement path ways.
- Biological effects of complement
- A brief introduction of Immunodeficiency disease and Hypersensitivity reactions.
- Discussion on Auto immunity.
- A detailed study of Vaccines & adjuvants.
- Descriptive study of **Antigen-antibody reactions** –
Precipitation, Agglutination, Complement fixation, Neutralization, ELISA, RIA, IF, (more emphasis should be given to ELISA, IF, Counter current immunoelectrophoresis)

PRACTICALS 230 Hours

- Introduction and demonstration of Laboratory Equipment used in Microbiology.
- Cleaning of new and used glass wares for microbiological purposes. Students be familiar to use autoclave, hot air oven, water bath, steamer etc.
- Demonstration of different types of physical methods of sterilization
- Sterilization of heat labile fluids, glass wares, liquids, plastic and other laboratory and hospital wares.
- Demonstration of different methods of disinfection
- Students should be familiar to use different types of filters and its decontamination.
- Rideal - Walker test or chick - Martin test.
- Test for minimum inhibitory concentration of at least 2 commercially available disinfectants, In use test
- Students should prepare the working dilutions of common disinfectant.
- Decontamination of wastes and carcasses – method
- Students should be thorough to work with light microscope
- Study of the morphological characters of bacteria
- Detection of motility *- Hanging drop examinations with motile bacteria, non - motile bacteria. Method by using semi solid medium.
- Preparation and examination of wet films*.
Direct microscopic examination of wet film
- Preparation of smear, fixation and staining of bacterial smears and its quality control methods

- Simple staining methods* – Pure culture, mixed culture
 - Gram's staining and any one modification* – Pure culture - Mixed culture
 - A.F.B. staining and its modification *– Normal smear, AFB positive smear
 - Fluorochrome staining and its demonstration
 - Special staining technique for the demonstration of bacterial capsule (any two methods)
 - Special staining technique for the demonstration of spores (any one method)
 - Special staining technique for the demonstration of Flagella (Any one method)
 - Special staining technique for the demonstration of volutin granules
 - Preparation of stains and reagents used for the above staining technique.
- Quality control testing for the stains.

(repeated exercises should be given till the students become thorough in (*) marked techniques)

RECOMMENDED BOOKS

1. Mackie & Macartney practical medical Microbiology - Collee. Fraser, Mar mion, Simmons
2. Medical Laboratory Manual for Tropical Countries Vol-1 & Vol - 2 Monica Cheesbrough
3. Text Book of Microbiology- Baveja
4. Text Book of Microbiology-Ananthanarayanan & Jayaram Panikker
5. Essential Immunology-Roitt

REFERENCE BOOKS

1. Medical Microbiology - David green Wood, Slack Pentherer
2. Topley and Wilson's Microbiology and Microbial infections 9th edi: Leslie Collier, Albert Balow Vol – 2 Systematic Bacteriology
3. Medical Laboratory Technology – Kanai. L. Mukherjee.
4. Sterilization and Disinfection – G. Sykes
5. Sterilization and Disinfection – Black.
6. Bailey and Scott's Diagnostic Microbiology : Forbes Sahn, Weissfeld
7. Foundations in Microbiology -Talaro, Taloro
8. Microbiology an Introduction – Tortora, Funke, Case.
9. Microbiology – Prescott Harly Klein.
10. Laboratory Experiments in Microbiology – Johson Case.
11. Microbiology in practice - Lois Beisheir.
12. Microbiology – A Laboratory Manual.- Cappuccino, Sherman
13. Microbiology – Pelczar, Chan, Krieg.
14. Introductory Immunology - Davie
15. Fundamental Immunology - Paul
16. Basic & Clinical Immunology - Daniel P. Stites.

PAPER IV - BASIC MEDICAL LABORATORY SCIENCE AND HAEMATOLOGY-I

130 Hours

BASIC MEDICAL LABORATORY SCIENCES - 50 Hours

1.**Introduction to National Healthcare System-5 hours

The course provides the students a basic insight into the main features of Indian health care delivery system and how it compares with the other systems of the world. Topics to be covered under the subject are as follows:

1. Introduction to healthcare delivery system
 - a. Healthcare delivery system in India at primary, secondary and tertiary care
 - b. Community participation in healthcare delivery system
 - c. Health system in developed countries.
 - d. Private Sector
 - e. National Health Mission
 - f. National Health Policy
 - g. Issues in Health Care Delivery System in India
2. National Health Programme- Background objectives, action plan, targets, operations, achievements and constraints in various National Health Programme.
3. Introduction to AYUSH system of medicine (not asked for University examination)
 - a. Introduction to Ayurveda.
 - b. Yoga and Naturopathy
 - c. Unani
 - d. Siddha
 - e. Homeopathy
4. Health scenario of India- past, present and future
5. Demography & Vital Statistics-
 - a. Demography – its concept
 - b. Significance and recording of vital statistics
 - c. Census & its impact on health policy
- 6 . Epidemiology
 - a. Principles of Epidemiology
 - b. Natural History of disease
 - c. Methods of Epidemiological studies
 - d. Epidemiology of communicable & non-communicable diseases, disease transmission, host defence, immunizing agents, cold chain, immunization, disease monitoring and surveillance.

study. Spelling is critical and will be counted when grading tests.

Topics to be covered under the subject are as

1. Derivation of medical terms.
2. Define word roots, prefixes, and suffixes.
3. Conventions for combined morphemes and the formation of plurals.
4. Basic medical terms.
5. Form medical terms utilizing roots, suffixes, prefixes, and combining roots.
6. Interpret basic medical abbreviations/symbols.
7. Utilize diagnostic, surgical, and procedural terms and abbreviations related to the integumentary system, musculoskeletal system, respiratory system, cardiovascular system, nervous system, and endocrine system.
8. Interpret medical orders/reports.
9. Data entry and management on electronic health record system.

3. **Basics of emergency care and life support skills

Basic life support (BLS) is the foundation for saving lives following cardiac arrest. Fundamental aspects of BLS include immediate recognition of sudden cardiac arrest (SCA) and activation of the emergency response system, early cardiopulmonary resuscitation (CPR), and rapid defibrillation with an automated external defibrillator (AED). Initial recognition and response to heart attack and stroke are also considered part of BLS. The student is also expected to learn about basic emergency care including first aid and triage. Topics to be covered under the subject are as follows:

- a. Vital signs and primary assessment
- b. Basic emergency care – first aid and triage
- c. Ventilations including use of bag-valve-masks (BVMs)
- d. Choking, rescue breathing methods
- e. One- and Two-rescuer CPR
- f. Using an AED (Automated external defibrillator).
- g. Managing an emergency including moving a patient

At the end of this topic, focus should be to teach the students to perform the maneuvers in simulation lab and to test their skills with focus on airways management and chest compressions. At the end of the foundation course, each student should be able to perform and execute/operate on the above mentioned modalities.

4. Medical law and ethics

1. Medical ethics - Definition - Goal - Scope
2. Introduction to Code of conduct
3. Basic principles of medical ethics – Confidentiality
4. Malpractice and negligence - Rational and irrational drug therapy
5. Autonomy and informed consent - Right of patients
6. Care of the terminally ill- Euthanasia
7. Organ transplantation
8. Medico legal aspects of medical records – Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.

9. Professional Indemnity insurance policy
10. Development of standardized protocol to avoid near miss or sentinel events
11. Obtaining an informed consent.

5. Basics of Medical Laboratory

- Role of Laboratory in Health care delivery
- Care of laboratory wares, equipments and chemicals: general principles.
- Glass – composition, properties, varieties, grades of glass wares.
- Making simple glass wares in the laboratory – glass blowing techniques
- Common laboratory wares – PVC, polycarbonate, plastic.
- Advantages and disadvantages of various disposable lab ware.
- Cleaning of laboratory wares. Preparation of cleaning solutions. Care of laboratory wares and utensils.
- Laboratory safety – General principles, laboratory hazards and safety measures, universal safety precautions.

6. Microscopes

- History and development of microscopes.
- A brief review of light microscopes, its image formation, numerical aperture & resolution, magnification.
- Different types of objectives, eye piece, condensers and illuminations, their applications.
- Methods of use of microscopes for the demonstration of wet films and dry preparations.
- Care and safe use of microscopes.
- Classification of microscopes.
 - Bright field monocular & binocular microscopes.
 - Phase contrast microscope.
 - Dark ground microscope.
 - Fluorescent microscope.
 - Electron microscope.

Principles, methods of safe working, different parts, use, preparation of smears for its examinations and application of the above microscopes.

- Micrometry – Light microscopic micrometry, Photographic micrometry and electron microscopic micrometer.

7. HAEMATOLOGY-I - 80 Hours

- Origin, development, maturation, function and fate of blood cells.
- Capillary and Venous blood. Methods of blood collection.
- Various anticoagulants, their functions, uses, advantages and disadvantages.
- Principles of staining, Romanowsky stains, preparations and staining properties of various Romanowsky stains with emphasis to Leishman's stain. Preparation and use of Buffer solutions in staining.
- Preparation of Blood smears. Thin smear, thick smear, wet preparations and buffy coat preparation.

- Leishman's staining,
- Different Leucocyte count in Blood smears with recognition of abnormal blood cells.
- Collection of bone marrow and Preparation of Bone marrow smears, Morphologic study of Marrow films and its differential count. Indications of Bone marrow aspiration.
- Different types of Haemocytometers & their rulings
- Total count of RBCs, WBC (with correction of NRBC), Eosinophils and platelets. Micropipette methods and Bulk dilution technique, their advantages and disadvantages. Composition, function, preparation and storage of various diluting fluid. Errors in sampling, mixing, diluting and counting, Quality control methods in cell counts.
- Automatic Blood cell counters.
- Haemoglobin and Estimation of Haemoglobin – Principles, techniques, advantages and disadvantages of different methods. Normal and abnormal values. Errors and quality control in various methods.
- Abnormal Haemoglobin Method of identification of abnormal Haemoglobin. Sickling phenomenon. Hb-F and its demonstration.
- Principles and different methods of determining ESR and PCV. Advantages and disadvantages of each method. Clinical significance of ESR and PCV, Normal values.
- Methods of determination of Red Cell Indices (MCV, MCH, MCHC and Colour Indices) and its significance.
- Supravital staining technique – Principles and uses, Demonstration and counting of Reticulocytes. Composition and preparation of Brilliant Cresyl Blue and New methylene blue stains.

(NB- ** marked topics are desirable to know only. It will not be the part of assessment by the university exam)

Practical

- Care and use of light microscope
- capillary and venous blood collection
- Preparation of anticoagulant bottle
- Preparation of Romanowsky staining solutions
- Preparation of diluting fluids for cell counts.
- Preparation of thick and thin smears and their staining
- Haemoglobin estimation- cyan methaemoglobin method and Sahli's method
- ESR determination
- RBC count
- WBC count
- Differential count
- Platelet count
- Absolute eosinophil count
- Reticulocyte count
- PCV, Red cell indices.
- Osmotic fragility test

REFERENCE BOOKS

1. Laboratory acquired infections – C.H. Collins.
2. Clinical Diagnosis and Management by Laboratory methods – Todd, Sandford, Davidson
3. Manual of clinical laboratory methods-Copal.E.Hopier
4. Medical laboratory methods-Dr.Ramnik sood
5. Clinical laboratory methods-Beuer
6. Introduction to Medical laboratory technology-Baker
7. Practical haematology- Dacie and Lewis

SECOND YEAR

PAPER V BIOCHEMISTRY II 90 hours

1. CARBOHYDRATE METABOLISM:

- Glycolysis, Cori's Cycle, Oxidation of pyruvates. Citric Acid Cycle, Hexose MonoPhosphate Shunt Pathway, Glucuronic acid Pathway, Gluconeogenesis,
- Glycogenolysis, Regulation of Glycogen Metabolism, Fructose Metabolism, Galactose Metabolism, Glyoxlate Cycle, Hormonal regulation of Blood Glucose, Hyper glycemia & Diabetes Mellitus, Diabetic Ketoacidosis, Glycosuria,
- Hypoglycemia, Pentosuria, fructosuria, galactosemia & Glycosylated Hemoglobin.
- Investigation of disorders of carbohydrate metabolism: glucose, Glucose tolerance tests & other tolerance tests

2. METABOLISM OF PROTEINS & AMINO ACIDS

- Metabolism of individual amino acids.
- Catabolism of Amino Acids, Formation of Ammonia, Transamination and Oxidative deamination. Urea Cycle.
- Formation of Creatine and Creatinine. One Carbon Metabolism, Conversion of amino acids to specialized products.
- Principles and methods for the estimation of Urea, creatine, creatinine, Total protein and Albumin

3. METABOLISM OF LIPIDS

- Oxidation of fatty acids, Biosynthesis of fatty acids, Ketogenesis.
- Biosynthesis of Triglycerides, Phospholipids & Sphingolipids
- Biosynthesis of cholesterol & Bile Acids, Plasma Lipoproteins, Apo lipoproteins & Lipoprotein metabolism
- Obesity, Fatty Liver, Lipotropic factors and ketosis
- PUFA , Lipid per oxidation & Eicosanoids-Prostaglandins & Leukotrienes

- Lipid and Lipoprotein measurements- blood sampling and storage, Estimation of lipids-Cholesterol, Triglycerides, Phospholipids & lipoproteins- Colorimetric and enzymatic methods

Inter – relation between the metabolism of Carbohydrate, lipids and proteins,

- Generation of ATP, substrate level phosphorylation & Oxidative phosphorylation
- Brief out line of Electron transport chain

4. NUCLEIC ACID METABOLISM

- Biosynthesis of Purine and Pyrimidine nucleotides, denovo and salvage pathway
- Degradation of purine and pyrimidine nucleotides
- Principles & methods for the estimation of Uric acid

5. COMMON INBORN ERRORS OF METABOLISM

- Disorders of Carbohydrates metabolism – Glycogen storage diseases, galactosemia, fructose & Lactose intolerance
- Disorders of lipid metabolism-DYSLIPOPROTEINEMIA- Hypolipoproteinemia, Hyper lipo proteinemia , Atherosclerosis and sphingolipidosis.
- Disorders of Amino Acid metabolism, Cystinuria, Haemoystinuria, Cystathionuria, Phenyl ketonuria, Alkaptonuria, Albinism. Maple Syrup Urine diseases, Hartnups’s diseases.
- Disorders of Nucleic acid metabolism - Gout, Lesch-Nyhan Syndrome, Laboratory diagnosis of Inborn errors of metabolism

6. VITAMINS AND CO-ENZYMES:

- Vitamins- water soluble-Chemistry, sources, RDA, Biochemical role ,Deficiency and assay
- Vitamins Fat soluble-chemistry, sources, RDA, biochemical role, Deficiency, toxicity and assay
- Estimation of Vitamin A, C, E and B.

7. NUTRITION

- Nutritional importance and Calorific value of food- BMR
- Protein energy malnutrition- Kwashiorkor and Marasmus

8. URINE

- Composition of normal and abnormal constituents
- Routine examination of Urine, Specific gravity, reactions, detection of protein, reducing sugar, ketone bodies, bile pigment, bile salts, Urobilinogen and blood in Urine.
- Urinary screening for Metabolic inherited diseases

9. C.S.F AND OTHER BODY FLUIDS

- Physical and chemical examinations. Estimation of sugar, protein and chloride
- Composition and Chemical analysis of Synovial, Pleural, Peritoneal, Pericardial, Amniotic fluid etc
- Estimation of sugar, protein and chloride in CSF

10. Common Laboratory methods, estimation and its interpretation of Glucose, protein, Cholesterol (total , HDL,LDL&VLDL), Uric Acid, Creatine, Creatinine, Urea, Triglyceride, phospholipids, Total lipids, Glycosylated Haemoglobin and tests for inborn errors of Amino acid metabolism

BIOCHEMISTRY – II

PRACTICAL 174 hours

1. Estimation and standardization of Blood/Serum/Plasma constituents glucose, Urea, Total protein, Albumin, Cholesterol, Triglyceride, Phospholipids, total lipid - Uric Acid, Creatine, Creatinine, Ammonia, Non- protein nitrogen, Amino Acid Nitrogen
2. Qualitative detection of normal and abnormal constituents of Urine.
3. Quantitative analysis for Urine protein, Bence-Johne's protein, Reducing sugars and chloride in Urine, Urea, Creatinine, Uric Acid, Aminoacids, Ammonia, Keto acids in Urine.
4. Estimation of sugar, protein and chloride from C.S.F., plural fluid, peritoneal fluid, amniotic fluid - foam test
5. Glucose tolerance test and GCT
6. Estimation of Ketone bodies in blood and urine.
7. Estimation of Glycosylated Haemoglobin
8. Estimation of Vitamin A,C,E and Metabolites of Vitamins in Urine (B complex)
9. Tests for inborn errors of Amino Acid metabolism in Urine.

RECOMMENDED TEXT BOOKS:

1. Harper's Biochemistry: R. K. Murray and Grannor
2. Test book of Biochemistry: Vasudevan and Sreekumari
3. Practical – Clinical Biochemistry - Volume 1: Harold Yarkey
4. Clinical Biochemistry - Principles and Practice: Praful B. Godkar
5. Clinical Laboratory methods and diagnosis: Gradwohl

REFERENCE BOOKS

1. Principles of Biochemistry: Lehniger
2. Biochemistry: Luberrt Strayer
3. Text book of Clinical Chemistry: Novert W. Teitz

4. Biochemistry with Clinical Correlation: Devlin
5. Internal Medicine: Harrison
6. Clinical Diagnosis and Management: John Bernard Henry

Paper VI
GENERAL MICROBIOLOGY – 90 hours

Topic

- Classification and taxonomy of Micro organisms.
- Bacterial growth and Nutrition – Batch culture, Continuous culture, and growth curve, total count and viable count.
- A brief description on microbial metabolism, catabolism, respiration and Anabolism.

NUTRIENTS FOR MICROBIAL GROWTH

- Physical conditions required for bacterial growth- Oxygen, CO₂, Temperature, water, pH, Light, osmotic pressure.
- Major requirements and common ingredients of culture media.
- Media for microbial growth – classification of media- Routine laboratory media like
- Basal - Peptone water, Nutrient broth, Nutrient agar
- Enriched - Blood agar, Chocolate agar, R.C.M
- Enrichment - Alkaline- Peptone Water, Selenite F broth
- Selective - MaC conkey agar, XLD, DCA, TCBSA, L.J.medium, Tellurite blood agar
- Differential - MaC conkey agar, CLED.
- Transport media, Anaerobic media.
- Principles and method of preparation, pH adjustments- different methods, sterilization, storage of different types of media.
- Quality control in media preparation.
- Cultivation of Bacteria – Equipments and devices used in the cultivation bacteria.
- Inoculation methods, incubation methods, Inoculation on different types of culture media in Petri dish, Slopes, Butt, Broths.
- Incubation methods
- Morphological study of bacterial colonies on plated media.
- Growth characteristics of bacteria on liquid media.
- Anaerobic culture methods with recent advance.

Quantitation of Microorganisms:

- Quantitation of microorganism - using photoelectric colorimeter and spectrophotometer.
- Total count and viable count
- A brief description method of measuring bacterial growth by determining its dry weight, wet weight, Total nitrogen concentration.
- Preparation of Mc Farland standard and its interpretation / Simple opacity tubes.

Typing methods

- Bacteriophage and Bacteriophage typing method.
- Bacteriocin and Bacteriocin typing

Biochemical Tests

- Tests for identification of bacteria, detailed study of the principle, preparation of media, reagents used different methods, interpretation and quality control for the following identification tests.
- Tests for the metabolism of Carbohydrates- OF test, simple sugar media, TSI/KIA, citrate utilization, MR, VP tests
- Tests for the metabolism of proteins and Amino acids- Indole, PPA, Gelatin liquefaction, Amino acid metabolism test
- Tests for enzymes. - Catalase, Urease, Nitrate reductase, Coagulase, and Oxidase.
- Tests for the metabolism of fat.
- Rapid identification tests.

BACTERIAL GENETICS

- General Principles of Bacterial Genetics
- Genetic Organization and Regulation of the Bacterial cell
Genotypic Phenotypic variation, Operon model of gene expression
- Mutation -Types of mutation, Mutagens, Isolation of mutants
- Gene transfer – Transformation, Conjugation, Transduction
- Plasmids & Transposons.

CARE AND MANAGEMENT OF LABORATORY ANIMALS

- A Basic knowledge of the feeding, housing, breeding and care of the following animals
- -rabbit, rat, mouse, guinea pig.
- Handling and care of normal and infected animals in the laboratory and in the animal house.
- Collection of blood samples
- Killing of animals and post- mortem examination
- Different routes of animal inoculations: scarification, subcutaneous injections, intravenous inoculation, intra-peritoneal inoculations, intramuscular inoculations, intracerebral, intra-testicular inoculation.
- Animal House records
- Disposal of dead animals

PRACTICALS 174 Hours

- Preparation and use of pH indicator solutions
- Preparation of Reagents used for pH adjustments
- Adjustments of pH for Acidic medium and alkaline medium by using Lovibond Comparator
- Cleaning and preparation of glassware for media preparation and sterilization
- Preparation of sterile Saline.

- Students should be familiar to prepare the commonly used laboratory media and also they should know its sterilization, Quality control and storage. Peptone water, Nutrient broth, Nutrient agar, Blood agar, Chocolate agar, R.C.M , Alk.Peptone Water, Selenite F broth, MaC conkey agar, XLD, TCBSA, L.J.medium, Transport medium (anyone) and other Media routinely used for the isolation for medically important bacteria.
- Preparation and standardization of bacterial loop.
- Inoculation methods on plate media, liquid media and slope media
- Inoculation and isolation of pure and mixed bacterial culture
- Study of colony characters on different media.
- Viable count of bacteria from a culture. Preparation of standard opacity tubes.
 - Aerobic and Anaerobic incubation technique
 - Preparation, Sterilization, Quality control, Inoculation and use of Biochemical media and its reagents used in bacteriology.
 - Preparation of Reagents like methyl red indicator, V.P.Reagent, Nitrate reagents, Ferric Chloride. ONPG, H₂O₂, Oxidase reagent, Kovac's reagent, Ehrlich's reagent.
 - Inoculation methods and Quality control in different Biochemical media.
 - Anaerobic cultivation methods - Anaerobic jar - Other methods-Quality control
 - Students should visit an Animal house and observe the organization and management of animal houses and its stock. Also they should observe the management of animals on experiments, safe handling of laboratory animals like Rabbit, Rat, Mouse, Guinea Pig.

RECOMMENDED BOOKS

1. Mackie & McCartney practical medical Microbiology - Colle. Fraser, Marmion, Simmons
2. Medical Laboratory Manual for Tropical Countries Vol - 2 Monica Cheesbrough

REFERENCE BOOKS

1. Medical Microbiology - David green Wood, Slack Pentherer
2. Topley and Wilson's Microbiology and Microbial infections 9th edi: Leslie Collier, Albert Balow Vol – 2 Systematic Bacteriology
3. Cowan & Steel's Manual for the Identification of Medical Bacteria – G.I Barron, K.K.A.Feltham.

Paper VII . PARASITOLOGY & ENTOMOLOGY - 90 hours

Topic

PARASITOLOGY 45 Hours

An elementary study of the types of animal associations, parasitism commensalism and Symbiosis.

Types of Parasites. Classification of protozoa & Helminthes.

An elementary knowledge of the structure, life history of parasites belonging to the following genera with reference to the forms seen in human pathological material and the methods used to identify them.

- a. **Protozoa** : Entamoeba, Dientamoeba, Iodomoeba, Trichomonas, Trypanosoma,

Leishmania, Giardia, Plasmodium, Isospora, Balantidium, Toxoplasma, Pneumocystis carinii, Cryptosporidium, cabiesia.

b. **Platyhelminthes:** Diphyllbothrium, sparganum, Taenia, Echinococcus, Hymenolepis, Schistosoma, Fasciola, Fasciolopsis, Clonorchis, Paragonimus

c. **Nemathelminthes:** Ascaris, Ancylostoma, Necator, Strongyloides, Trichinella, Enterobius, Trichuris, Filaria.

Collection, preservation and transport of specimens for parasitological examination, preservation of specimens of parasite eggs or embryos, preserving fluids.

Detection of Intestinal parasites: Detection and identification of amoeba and other intestinal protozoa and other parasites in faecal samples.

Detection of Blood parasites: Detection and identification of Malaria, Microfilaria and other blood parasites.

Examination of biopsy material and other body fluids: Brief account of spleen puncture for diagnosis of kala-azar, bone marrow biopsy, lymph node, and skin biopsy for parasites.

Examination of urine for parasites.

Practical: 87 Hours

- Identification of parasites of medical importance dealt in the theory
- Macroscopic and microscopic examination of stool for adult worms, ova, cysts, larvae
- Concentration techniques for intestinal parasites in stool
- Collection of blood and preparation of thin and thick smears
- Staining of blood smears for blood parasites
- Examination of blood smears for malaria and microfilaria and their identification

**ENTOMOLOGY
45 hours**

Introduction. Classification of Arthropods of public health importance.

- Role of Arthropods in the transmission of diseases.
- Mosquito: Morphology, Lifecycle, Bionomics and public health importance of anopheles, Culex, Aedes and Mansonia.
- Mosquito Control: Various methods. Mosquito – borne diseases and their control.
- Phlebotomes (Sand fly): Morphology, Life cycle, public health importance and control.
- House Fly: Morphology, life cycle and public Health importance.
- Black Fly (Simulium) morphology, life cycle, public health importance and control.
- Fleas : Morphology, life cycle disease transmitted and control
- Louse: Morphology, lifecycle, disease transmitted and control.
- Bedbug: Morphology, Lifecycle, disease transmitted and control.
- Ticks: Morphology, Lifecycle, disease transmitted and control.
- Trombiculid: Morphology, Lifecycle, disease relationship and control.
- Sarcoptes scabiei: morphology, life cycle, Public Health Importance and control.
- Cyclops: Morphology, Public Health importance and control.

- Insecticides used for the control of Arthropods of Public Health Importance, Classification, Insecticide, resistance, Bioassay test

Practical 87 Hours

- Identification of arthropods of Medical importance dealt in the theory.
- Identification up to genera of common vectors of Malaria, Filariasis, Japanese Encephalitis and Dengue.
- Collection and preservation of arthropods of public health importance.
- Preparation of permanent mounts of arthropods of public health importance. (Minimum 10 slides)
- Dissection of Mosquitoes to display mouth parts, wings, and legs.

Books recommended:

1. Medical parasitology: N.C.Dey
2. A guide to medical entomology: W W Service
3. Entomology in human and animal health: Harwood and Maurice T James
4. Text book of Medical parasitology- KD.Chatterjee
5. Medical Laboratory Manual for Tropical Countries Vol-1 Monica Cheesbrough
6. Text Book of Parasitology- Jayaram Panickar

Paper VIII

HAEMATOLOGY-II AND CLINICAL PATHOLOGY 90 HOURS

HAEMATOLOGY-II 60 Hours

- Morphology of Red cells in Health and diseases.
- Systematic methods of examination of Blood Film (Blood picture) and Reporting.
- Definition, classification and etiology of anaemia.
- Disorders of structure and synthesis of Haemoglobin.
- Principle, method and significance of Ham's test.
- Laboratory diagnosis of various types of anaemia, Polycythaemia, Polycythaemia vera Leucocytosis, Leucopenia, Eosinophilia, Neutrophilia, Basophilia, Lymphocytosis, Monocytosis, Agranulocytosis
- Infectious mononucleosis.
- Definition and classification of Leukaemia
- Blood and Bone marrow findings in Acute Myeloid Leukaemia (AML) Acute Lymphatic (ALL) Chronic Myeloid Leukaemia(CML), Chronic Lymphatic Leukaemia(CLL), Leukaemoid Blood Reactions.
- Multiple myeloma.
- Cytochemistry – Peroxidase, PAS, LAP, esterase.
- Perl's Staining and its significance.

- Identification of parasites (Malaria, Microfilaria, L.D. bodies and Trypanosomes) in Blood and Bone marrow films.
- General introduction to Bone marrow transplantation techniques.
- LE phenomenon and demonstration of LE cell, Principle
- Coagulation factors, mechanism of blood coagulation, Fibrinolytic system, Disorders of coagulations.
- Laboratory methods used in the investigation of haemostasis:- Clotting time, Bleeding time, Partial Thromboplastin time, Plasma prothrombin time, INR. Thromboplastin generation time, Prothrombin consumption time, Thrombin time, Test for fibrinogen degradation product. Test for fibrinolysis. Assay of plasma fibrinogen.
- Haemophilia and its laboratory parameters.
- Disorders of Platelets and Blood vessels.
- Platelet function test.
- Automation and Recent advance in Haematological Techniques.

CLINICAL PATHOLOGY 30 Hours

1. Urine

- Microscopical examination of urine, collection of urine and its preservation, Colour, cloudiness, specific gravity, reaction, pH
- Different methods for detection, importance and its interpretation of – Protein, Sugar, Bile pigment, Bile salt, Urobilinogen, ketone bodies, Bence-Jones protein & Blood
- Examination and identification of sediment for: various cells, crystals, casts, parasites.
- Concentration methods for examination identification of urine sediment for: Gonococci, Trichomonas vaginalis, monilia.
- Pregnancy test-Production of HCG, HCG level at various stages of pregnancy, pregnancy test, Different types of pregnancy test such as Gravindex test & card

2. Faeces

- Examination of motion sample for: colour, mucous, consistency, ova, Amoeba, cyst, Parasites, Puscells, RBCs & crystals.
- Detection of occult blood in stool, measurement of faecal urobilinogen & faecal fat, their importance interpretations.

3. Sputum

- Method for the collection, examination of sputum for AFB, sputum in disease

4. Semen

- Methods of collection, Macroscopic and microscopic examination of semen, Motility, count, other findings.
- Staining and morphological studies of spermatozoa, importance & interpretation in

5. Cerebrospinal Fluid

- Collection, transport, preservation, examination and interpretation total and differential count, staining methods, CSF in disease.

6. Other Body Fluids

- Examination of Ascitic fluid, Pleural fluid, Pericardial fluid, Synovial fluid.

Practical 174 Hours

- Peripheral blood smear examination and reporting
- Haemoglobin electrophoresis
- Blood cell cytochemistry- Peroxidase, PAS, LAP, Esterase
- Perl's stain
- Osmotic fragility test
- Sickling test
- LE cell demonstration
- Bleeding Time, Clotting Time, PT and APTT, clot retraction test, fibrinolysis test
- Serum electrophoresis of myeloma proteins.
- Familiarisation of automation in Haematology
- Urine analysis, pregnancy test
- Examination of faeces, detection of occult blood in stool, faecal urobilinogen and faecal fat detection
- Semen analysis
- Examination of CSF
- Examination of body fluids
- Examination of sputum

Books recommended for reference

- | | |
|---|-----------------|
| 1. Lynch's Medical Laboratory Technology | -Raphael |
| 2. Gradworl clinical laboratory methods & diagnosis | |
| 3. Medical laboratory technology and clinical pathology
Lynch, Raphael, Meller | - |
| 4. Manual of clinical laboratory methods | -Copal.E.Hopier |
| 5. Medical laboratory methods
sood | -Dr.Ramnik |
| 6. Clinical laboratory methods | -Beuer. |
| 7. Introduction to Medical laboratory technology | -Baker |
| 8. Clinical pathology and bacteriology | -Sachdev |
| 9. Clinical pathology | -Batra. |
| 10. Hand book of routine urine analysis | - Graft |
| 11. Practical haematology
Lewis. | - Dacie and |

THIRD YEAR

Paper IX - Biochemistry-III - Theory: 100 HOURS

1. ENZYMES

Classification , Co-enzymes, Co factors, Mechanism of enzyme action, factors affecting in Enzyme action , Enzyme Kinetics, Michaelis Menton constant, Enzyme Inhibition , Regulatory enzymes, Immobilization of enzymes

Clinical Enzymology

- Enzyme activity determinations-End point assay and Kinetic assay.
- Principles & Methods for the activity determination of Phosphatases, Transaminases, Amylase, lipase, Lactate dehydrogenase, Creatine kinase, Ceruloplsmin, Glucose 6 phosphate dehydrogenase, Aldolase, 5'-Nucleotidase, Leucine Amino peptidase, Gamma glutamyl transpeptidase, Cholin esterase, Enolase , Isocitrate dehydrogenase
- Isoenzymes in Diagnostic Biochemistry-
 - Plasma isoenzyme pattern in diseases- MI, Liver disease, Muscle disease etc

2. HAEMOGLOBIN

- Chemistry and properties of Haemoglobin and myoglobin, Chemistry of respiration, Transport of gases. Oxygen dissociation curve, Isohydic transport of Carbondioxide, Biosynthesis of Haemoglobin, Catabolism of Haem,
- Bile pigments- Bilirubin and related chromoproteins.
- Haemoglobin derivatives , Haemoglobin variants, Jaundice
- Principles & Methods for the estimation of Direct and total Bilirubin, Urobilinogen and urobilin
- Congenital disorder of haem metabolism

3. PORPHYRINS

- Porphyrins and disorders of porphyrin metabolism.
- Chemistry of porphyrins
- Porphyrins: primary and secondary porphyrias and its analytical procedures.
 - Methods for the estimation porphyrias and its precursors in urine

4. ANALYTICAL CALCULI

- Urinary & Biliary calculi

5. ELECTROPHORESIS

- Theory of electrophoresis, General methods of Electrophoresis- paper, gel, disc and Immuno electrophoresis, isoelectric focussing.
- Electrophoresis of Serum protein and its interpretations
- Electrophoresis of Haemoglobin and its interpretations.
- Electrophoresis of Lipoproteins and its interpretations

6. CHROMATOGRAPHY

- Principles and application of Chromatography, Forms of chromatography- absorption, ion exchange, gel, affinity , paper, thin layer, HPLC and gas liquid chromatography.
- Chromatography of Aminoacid , Aminogram and chromatography of sugars & lipids.
- Aminoaciduria

7. IMMUNOLOGICAL METHODS AND RELATED TECHNIQUES

- Antigen- Antibody reactions. Immunodiffusions (ID), Immunelectrophoresis, Radioimmunoassay (RIA), ELISA and Fluorescent immunoassay(FIA)
- Receptor assays
- Clearance tests-urea, creatinine, inulin

PRACTICALS - 200 hours

1. Activity determination of Clinically important enzymes- Alkaline Phosphates , Acid phosphates, Alanine amino transferase , Aspartate aminotransferase, Amylase, Ceruloplasmin, LDH, CPK and G6 PD
2. Testing and semi quantitative assesment of urobilinogen in urine estimation of urobilin in urine, Estimation of porphyrin and porphobilinogen
3. Estimation of bilirubin - direct and total.
4. Qualitative analysis of Urinary calculi.
5. Estimation of Haemoglobin, myoglobin and abnormal haemoglobins- Hb electrophoresis
6. Identification of substances by column chromatography, Thin layer chromatography, paper chromatography, amino acids (Amino gram) and sugars.
7. Technique of paper electrophoresis, agar gel electrophoresis of serum proteins, Polyacrylamide gel electrophoresis of serum proteins & Lipoproteins
8. Clearance tests - Creatinine and Urea clearance
9. Technique of RIA (T3, T4 and TSH) and ELISA.

Recommended text books

1. Text book of Biochemistry- DM.Vasudevan and Sree kumari. S
2. Practical Clinical Biochemistry- Harold varley
3. Practical biochemistry - Wilson and walker

Reference books

- | | |
|------------------------------------|------------------|
| 1. Principles of Biochemistry | -Lehninger, |
| 2. Biochemistry | - Lubert stryer, |
| 3. Text book of Clinical chemistry | - Teitz, |
| 4. Clinical chemistry | - Kaplan, |
| 5. Clinical chemistry | -Marshal |

Paper X BACTERIOLOGY - 100 hours

Topic

1. SYSTEMIC BACTERIOLOGY

Detailed Systematic and diagnostic study of bacteria (emphasis should be given for medically important, pathogenic and related organism). A detailed study of general characters, classification, different pathogenic species, non-pathogenic (brief account only), morphology, staining characters, cultural characteristic in different

culture media, susceptible to physical and chemical agents, biochemical reactions, antigenic properties, special tests for identification of species, epidemiology, specimens and its collection, lab diagnosis, antibiotic sensitivity of the following bacteria.

- Staphylococcus, Streptococcus, Pneumococcus, Anaerobic cocci, Neisseria species,
- Listeria, Bacillus, Clostridium, Pseudomonas, Legionella, Non-fermenting gram negative rods, Bordetella, Brucella, Haemophilus, Pasteurella,
- Enterobacteriaceae (brief introduction of all the genus and detailed study for the medically important genus such as Escherichia, Klebsiella, Serretia, Enterobacter, Citrobacter, Proteus, Morganella, Providencia, Salmonella, Shigella, Yersinia),
- Mycobacteria.
- Actinomyces, Nocardia.
- Vibrio, Aeromonas, Plesiomonas
- Campylobacter, Helicobacter,
- Bacteriodes & other non sporing anaerobes, Chlamydia, Rickettsiae, Mycoplasma,
- Preservation of bacteria.
- Normal flora in a healthy human body.

DIAGNOSTIC BACTERIOLOGY

1. Specimen Processing

- Collection, preservation, transport and processing of clinical specimens for the diagnosis of bacterial infections.- Urine, Pus, CSF, Blood, Stool, Rectal swab, Body fluids, Exudates, Sputum, Throat swab, Eye specimens, Ear specimens, Tissues, Skin specimens

2. Antibiotic Susceptibility Tests

- Basic knowledge of various antimicrobial agents and their action on microbes.
- Detailed study of different methods of antibiotic susceptibility tests, media used preparation of antibiotic disc, selection of drugs, quality control, drug resistance, beta lactamase detection, antibiotic assay in blood and body fluids.

3. Bacterial infections and clinical syndromes

Detailed study of multiple etiology involving microorganisms and their laboratory diagnosis for the following clinical syndromes.

- Pyrexia of unknown origin, Enteric fever.
- Upper and lower respiratory tract infections, pleuropulmonary and bronchial infections, Tuberculosis.
- Urinary tract infections.
- Sexually transmitted diseases.
- Gastrointestinal infections, food poisoning, peritonitis.
- Infections in central nervous system – meningitis.
- Skin and soft tissue infections.
- Eye infections.

Students should know lab diagnosis of the following clinical conditions

- Brucellosis, Q fever, Gas gangrene, Diphtheria, Rat bite fever,

Relapsing fever, Rheumatic fever, Plague, Leptospirosis, Anthrax, Leprosy.

- Bacterial infections in the immunocompromised patients

4. Bacterial Serology

Students should know in detail the serodiagnosis of bacterial infections such as:

- Enteric fever – Widal test
- Syphilis – STS- VDRL Test, RPR, Treponemal tests-TPHA, TPI, FTA-ABS
- Streptococcal infections- ASO Test, Anti DNAase B, Antihyaluronidase test
- Brucellosis
- Rickettsial fever
- Primary atypical pneumonia.
- Weil felix test
- (An illustrative knowledge of collection of specimens, preservation, principles, preparation of antigens, methods, and interpretation).

Practical 174 Hours

Identification of medically important bacteria from pure culture.

- Staphylococcus.
- Streptococcus.
- Meningococcus, Gonococcus.
- Escherichia , Klebsiella, Serretia, Proteus, Salmonella, Shigella.
- Psuedomonas, Acinetobacter.
- Vibrio.
- Haemophilus.
- Students should be familiar with the collection, transportation and processing of all type of clinical specimens for the diagnosis of bacterial infections discussed in theory.
- Different methods & interpretation of antibiotic sensitivity tests.
- Isolation and identification of Mycobacterium tuberculosis from clinical specimens. Preparation of smear, staining, culture and reporting, concentration technique for
- Examination of specimens from patient for the diagnosis of leprosy.

Bacterial Serology

- Antigen preparation and standardization for Widal test. Widal test technique and interpretations
- VDRL Test, RPR, TPHA
- ASO Test
- Brucella agglutination test.

Recommended Books

1. Medical Microbiology - David green Wood, Slack Pentherer
2. Mackie & Macartney practical medical Microbiology - Colle. Fraser, Marmion, Simmons
3. Text Book of Microbiology :Ananthanarayanan & Jayaram Paniker
4. Medical Laboratory Manual for Tropical Countries Vol-2 Monica Cheesbrough.
5. Bailey and Scott's Diagnostic Microbiology :Forbes Sahn, Weissfeld

REFERENCE BOOKS

1. Topley and Wilson's Microbiology and Microbial infections 9th edi: Leslie Collier, Albert Balow Vol – 3 Bacterial Infections
2. Medical Bacteriology - C. H. Collins
3. Principles and Practice of Infectious diseases – Mandell, Bennett, Dolin Vol- 1 &
4. Colour Atlas and Text book of Diagnostic Microbiology Koneman & Allan Janda
5. Basic Laboratory Procedure in clinical Bacteriology WHO, Geneva.
6. Gradwohl's Clinical Laboratory Methods and diagnosis Vol – 2- Alex. C.Sonne.
7. Medical Microbiology – Murray, Kobayashi.
8. Medical Microbiology – Mims, Play fair, Roitt.
9. Microbiology and Infection – Inglis.
10. Microbiology Pelczar, Chan, Krieg

Paper XI

CYTOLOGY & TRANSFUSION TECHNOLOGY - 100 HOURS

Topic

CYTOLOGY 40 Hours

Introductions to Cytology

- History, development and scope of cytology.
- Cell structure, function, cell cycle, division with recent advances.
- Cytology of epithelial and connective tissues.

Cytopathology Techniques

Fixation of Cytology specimens – various fixatives, pre fixation, coating and spray fixation, advantages and disadvantages.

- I. Staining – Routine cytology stain Pap, MGG, H&E advantages and disadvantages.
- II. Collection, preparation of gynaecological and non-gynecological specimens- exfoliative cytology.
Gynecological – vaginal, cervical, endocervical, endometrial
Non-gynecological – sputum, bronchial, Body fluids (serous effusions), CSF, urine.
- III. Concentration technique in cytology - Centrifugation, cyto-centrifugation, membrane filters, cell blocks.
- IV. Liquid based cytology – monolayer preparation.

Female Genital Tract Cytology

- Cervical cytology: Normal cells in cervical smear, inflammatory lesions of the female genital tract – specific and nonspecific inflammation.
- Hormone cytology.

Respiratory tract cytology – sputum, bronchial materials.

Urinary tract cytology – urine.

Other Body Fluids

- Serous effusions.
- CSF

Gastro Intestinal Tract cytology.

Fine Needle Aspiration Cytology – Scope, advantages and disadvantages,

Organization of cytology lab.

Cytology laboratory safety.

Quality control measures in cytology.

Automation in cytology – Preparation, staining, Auto screening.

Topic
TRANSFUSION TECHNOLOGY
60 Hours

- General introduction to Blood Banking.
- Blood group and its inheritance. Laws of Heredity.
- ABO blood group system and its distribution.
- Inheritance and distribution of Rhesus system. General introduction to Rh system.
- Antigen Antibody reactions in immune Haematology.
- Naturally occurring and immune antibodies. Complement and Blood group antibodies.
- Preparation of grouping sera.
- General methods of Antigen and antibody detection.
- ABO grouping methods and factors influencing.
- Rh-typing methods (using complete and incomplete anti-D).
- The MNs blood group system. P-Blood group system. Lutherman Blood group system. Kell Blood group system, Lewis Blood group system. Duffy Blood group system, kid blood group system, Private Blood group, Bombay Blood group. Diego and I / I system. Du Antigen and their importance.
- Collection and storage of Blood sample for blood grouping, preservation of Red cells in Glycerol and in liquid Nitrogen, Storage of sera. Preparation and use of Enzyme treated Red cells in Blood grouping methods of differentiation of group A1 from Group A2. Secretors Non- secretors and the method to detect them.
- Blood grouping for Antenatal work. ABO and Rh Haemolytic disease of new born and principle of coomb's test - Direct and indirect their method and applications. Exchange Blood transfusion. Prevention methods of Rh-Haemolytic disease of Newborn.
- Compatibility test in blood transfusion and abnormal reactions which are not due to ABO or D- incompatibility. Compatibility testing method in urgent and Non-urgent cases. Special problems of compatibility.
- Antibody Titrations: Basic titration technique, Numerical scoring of results.
- General Management and Essential components in Blood Bank.
- Grouping, Cross matching and Serological tests on donor blood.
- Screening of Donors: Physical and clinical Examination. Copper sulphate method for Haemoglobin, Screening for Parasitic infections – Malaria, Filaria. VDRL test, Icteric Index, grouping and Rh-typing, Antibody screening, Screening for HBs Ag, HCV and HIV.
- Anticoagulant solution used in blood Transfusion. Pyrogen and its complications. Test for detecting pyrogens.
- Temperature for storage of Blood. Preservation / storage of Blood. Transport of Blood.

- Storage of Plasma. Disadvantage of storage. International colouring of Blood labels.
- Transfusion reactions, principles and methods of investigating transfusion reactions
- Transmission of diseases by blood transfusion
- Component therapy:- Preparation of transfusion of Leucocytes poor blood, red cells concentrate, platelet rich plasma, platelet concentrate, factor VIII concentrate, plasma apheresis, Transfusion in von Willebrand's disease, transfusion of plasma, transfusion of leucocytes/granulocytes, leucopheresis, transfusion of plasma components and preparation of cryoprecipitate, its use and advances
- Automation and recent developments in blood banking

Practical 200 Hours

- Preparation of fixatives used in cytology
- Papanicolaou staining, May Grunwald Giemsa stain
- Shorr stain
- Processing and staining of various fluids for cytological examination
- Examination of normal and inflammatory cervical smears.
- Demonstration of normal cytology of respiratory tract, urinary tract, CSF, effusions.
- Preparation of 5% red cell suspension.
- ABO Blood grouping – cell grouping and serum grouping
- Rh typing methods
- Du typing
- Preparation of IgG coated cells, Direct and Indirect Antiglobulin tests
- Antibody titration
- Secretory status
- Screening tests done in donors
- Collection and storage of blood in blood bank
- Separation of packed red cells, FFP and cryoprecipitate

BOOKS RECOMMENDED FOR CYTOLOGY

1. Diagnostic Cytology and its Histopathologic Basis - Vol 1 & II- E.G. Koss
2. Test Book of Cytology - Walter.V. Bran & Eldrige
3. Cytological techniques - J.F. Baker
4. Exfoliative cytology in Gynecological practice - Erisa.G. Wachtel
5. Diagnostic cytopathology in the uterine cervix - Glaudes Gempal
6. Atlas of Diagnostic cytology - Glaudes Gempal, Stanley.L.Lamber
7. Functional medical laboratory technology A comprehensive series of manual histology and cytology - Robert Rothatem Avi
8. Compendium on diagnostic cytology, Tutorial of cytology - Weid, George etal
9. Manual and atlas of fine needle aspiration cytology - Svante R, Orell.

Recommended books for Blood Banking:

1.	Basic Essentials of Blood Group Theory and Practice	-Boorman and Dodd
2.	Introduction to Blood Group serology	-Boorman and Dodd
3.	Essentials of Blood grouping and clinical applications	-K. S. Ranganathan
4.	Blood group Serology	-Boorman
5.	Laboratory Hand book of Blood Transfusion Technique	-Farr
6.	Blood Grouping Techniques	-Schief and Boyd
7.	Technical methods and procedures of the American Association of Blood Bank	-Revised 1956
8.	Clinical Blood Transfusion	-Kay
9.	Blood Transfusion	-Kelton
10.	Blood Transfusion in Clinical Medicine	-P. L. Mollison
11.	Manual of Clinical Blood Transfusion	-Brozovic

Paper XII

COMPUTER APPLICATIONS, RESEARCH METHODOLOGY, BIOSTATISTICS & LABORATORY MANAGEMENT - 90 HOURS

1 Basic Computer Sciences -20 hours

Topic

- a) Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).
- b) Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.
- c) Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.
- d) Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.
- e) Introduction of Operating System: introduction, operating system concepts, types of operating system.
- f) Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.
- g) Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.
- k) Application of Computers in clinical settings.

Practical on fundamentals of computers -

1. Learning to use MS office: MS word, MS PowerPoint, MS Excel.
2. To install different software.
3. Data entry efficiency

2. Research Methodology & Biostatistics - 25 hours

- a) Introduction to research methods
- b) Identifying research problem
- c) Ethical issues in research
- d) Research design
- e) Biostatistics: Probability & Sampling distribution; Estimation, Hypothesis testing & application; Correlation & regression analysis.
- f) Research methodologies: Study population; Variables; Sampling; Sample size determination; Plan for data collection; Methods of data collection; Plan for data processing and analysis; Ethical considerations.
- g) Developing a research proposal
- h) Computer Application in Research: Elementary knowledge of Statistical Analysis

3. Quality assurance and management – 10 hours

- a) Concepts of Quality of Care
- b) Quality Improvement Approaches
- c) Standards and Norms
- d) Quality Improvement Tools
- e) Introduction to NABL guidelines

4. Bio medical waste management and environment safety- 5 hours

The aim of this section will be to help prevent harm to workers, property, the environment and the general public. Topics to be covered under the subject are as follows:

- a) Definition of Biomedical Waste
- b) Waste minimization
- c) BMW – Segregation, collection, transportation, treatment and disposal (including color coding) Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste
- d) BMW Management & methods of disinfection
- e) Modern technology for handling BMW
- f) Use of Personal protective equipment (PPE)
- g) Monitoring & controlling of cross infection (Protective devices)

5. Principals of Management – 15 hours

- a) Introduction to management
- b) Strategic Management
- c) Foundations of Planning
- d) Planning Tools and Techniques
- e) Decision Making, conflict and stress management
- f) management
- g) Managing Change and Innovation
- h) Understanding Groups and Teams
- i) Leadership
- j) Time Management
- k) Cost and efficiency (including finance management)
- l) Fundamentals of emergency management, m) Psychological impact management,
- n) Resource management,
- o) Preparedness and risk reduction,
- p) Key response functions (including public health, logistics and governance, recovery, rehabilitation and reconstruction), information management, incident command and institutional mechanisms.

Infection prevention and control – 5 hours

- a) Evidence-based infection control principles and practices [such as sterilization, disinfection, effective hand hygiene and use of Personal protective equipment (PPE)],
- b) Prevention & control of common healthcare associated infections, c) Components of an effective infection control program, and
- d) Guidelines (NABH and JCI) for Hospital Infection Control

Professionalism and Values – 10 hours

- a) Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality
- b) Personal values- ethical or moral values
- c) Attitude and behaviour- professional behaviour, treating people equally
- d) Code of conduct , professional accountability and responsibility, misconduct e) Differences between professions and importance of team efforts
- f) Cultural issues in the healthcare environment

Reference Books

1. ABC of Research Methodology and Applied Biostatistics—A Primer for Clinicians and Researchers by N Parikh Mahendra, Gogtay Nithya
2. Fundamentals of Computer Science and Information Technology: Umesh Kumar Singh and Sumit Jain
3. Laboratory Management, Principles and Processes, Third Edition, Dr. Denise M. Harmening

4. Linne & Ringsrud's Clinical Laboratory Science: Concepts, Procedures and Clinical Applications

by Turgeon

5. Henry's Clinical Diagnosis and Management by Laboratory Methods, 22nd Edition, By Richard A. McPherson, MD and Matthew R. Pincus,

Question paper pattern for paper XII Computer Sciences, Research Methodology, Biostatistics & Laboratory Management is given below.

No	Topic	Theory Question paper mark pattern
1.	Part I Basic Computer Sciences for Allied Health Sciences	30
2.	Part 2 Research Methodology & Biostatistics	30
3.	Part 3 Quality assurance and management	10
4.	Part 4 Biomedical waste management	5
5.	Part 5 Principals of Management	15
6.	Part 6 Infection prevention and control	5
7.	Part 7 Professionalism and Values	5
	Total	100

FINAL YEAR

Paper XIII - Biochemistry-IV

Theory: 90 HOURS

Topic

1. MINERAL METABOLISM AND ESTIMATION

- Calcium, phosphate, magnesium, sodium, potassium, Chloride, Iron, Copper, Zinc, Iodine: metabolism and disorders.
- Methodology of the estimation of the above minerals in blood, plasma and other body fluids

2. FUNCTION TESTS

- Liver function tests: Disease of the liver-Jaundice, acute and chronic hepatitis, Cirrhosis, Cholestasis etc
- Kidney function tests
 - Glomerular function and measurements, clearance tests,
 - Tubular function tests, clinical syndromes
- Gastro intestinal function tests

-Collection of Gastric Juice. Tests for Gastric Function, Stimulation methods-Test meals, Measurements of other Gastric Components, Malabsorption, Tests for occult blood in faeces, Tests for malabsorption studies, Schilling test, D-xylose absorption test, faecal fat estimation.

- Estimation of free and total acidity

- Pancreatic function tests

- Tests in Pancreatic diseases

- Serum Enzymes and Urinary Enzymes

- Direct stimulation tests and indirect stimulation of the pancreas-Sweat tests

- THYROID FUNCTION TESTS-hyperthyroidism and hypothyroidism

- GONADAL FUNCTION TESTS –disorders in males and females

- FOETAL PLACENTAL FUNCTION TESTS -Haemolytic disease of Newborns, biochemical assay for fetal lung maturity, Biosynthesis of Estriol , measurements and clinical applications.

3. ACID-BASE BALANCE

- Body buffer system

- Respiratory regulation of pH, renal regulation of pH.

- Disturbance in acid base balance, Anion gap, metabolic acidosis, metabolic alkalosis, Respiratory acidosis, Respiratory alkalosis,

- Fluid and Electrolyte balance, osmolality, methodology of Blood pH and Gases estimation.

4 . AUTOMATION

Definition, functions, principle. Different parts and functions, merits and demerits of different auto analysers.

- Continuous flow analysers

- Discrete Analysers

- 1).Batch Analyzers – i) Semi auto analyzer, ii) Fully automated analyser

- 2).Stat Analyzer. – i) Centrifugal Analyzer, ii) Dry chemistry analyzer

- Recent trends in automation of clinical chemistry.

- Laboratory Informatics.

5. QUALITY CONTROL

- Definition of precision, Accuracy, Standard deviation
- Pre-analytical variables and Analytical variables
- Quality control charts, control sera
- Quality control programme

Internal quality control and External quality control

- Establishment and use of reference values, Analytical and Statistical procedures used in establishing reference values.

6. HORMONES

- General properties of hormones. Hormone action, pituitary hormones, hypothalamic hormones, Hormones of Pancreas, Thyroid, Parathyroid hormones, Hormones of adrenal medulla, adrenal cortex and Gonad.
 - Different methods for estimation of hormones and hormone metabolites in blood and Urine. Steroid hormones.
 - Chemistry & Metabolism. General techniques in steroid determination. 17-Oxo steroids and Oxogenic steroids, progesterone
 - Determination of Oestrogens, in plasma and Urine Urinary oestriol
 - Determination of Catecholamines Urinary VMA
 - Determination of urinary 5 HIAA
7. • Toxicology and drug assay in clinical biochemistry. General methods of analysis- and screening test for common drugs used in therapy
8. • Organization and management of the Clinical biochemistry laboratory
9. Molecular Biology :- replication of DNA – DNA repair
- Transcription – Genetic code
 - Translation- steps, factors ,inhibitors, post translational modification, protein folding & protein targeting
 - Molecular genetics, gene expression , Gene therapy
 - Techniques in Molecular Biology-recombinant DNA technology,
 - Blotting techniques,
 - PCR
 - Genomic library
 - Human genome project
 - Cloning.
 - FISH

PRATICALS 180 Hours

1. Estimation of calcium, Inorganic phosphorus, magnesium, Iron and Copper, Sodium and Potassium by flame Photometry.
2. Diagnosis of diseases with clinical correlation and Biochemical analysis of blood and Urine.
3. Determination of clearance-urea and creatinine
4. Gastric juice analysis

 Titrable acidity

 Test for malabsorption studies, D-Xylose,

 Stool fat, Occult blood in faeces.

5. Blood gas analysis, pH, PO₂, PCO₂.

 Estimation of bicarbonates

6. Estimation of hormone metabolites in Urine - 17-Ketosteroids, 17-Ketogenic Steroids, Urinary oestriol, Urinary VMA, 5 HIAA

7. Familiarization and usage of all types of auto analyser

8. Plotting of quality control charts and calculation of standard deviation

RECOMMENDED TEXT BOOK-BIOCHEMISTRY-PAPER IV

- | | |
|---|---------------------------------|
| Text book of clinical chemistry | -Nobert. W. Teitz |
| Practical clinical biochemistry | -Harold. Varkey-vol.1 & Vol. II |
| Clinical Biochemistry-Principles & Practice | - Praful. B. Godkar |

REFERENCE BOOKS		
1	Lecture notes on clinical chemistry	L.G. Whitby
2	Biochemistry a care oriented approach	Montgomery
3	Biochemistry in clinical practice	William's and Marks
4	Clinical chemistry	Kaplan

5	Clinical Chemistry in diagnosis and treatment	Philip .D. Mayne
6	Biochemistry	Trehan
7	Methods in Biostatistics	B.K. Mahajan
8	Clinical chemistry	Michael L.Bishop
9	Clinical biochemistry metabolic and clinical aspects	William.J.marshall7st ephen k.Bangert

Paper X IV

MYCOLOGY, VIROLOGY AND APPLIED MICROBIOLOGY - 90 hours

Topic

MYCOLOGY - 30 hours

- Introduction to Mycology
 - ☐ A brief study of classification of fungi
- Morphology of fungus, yeasts, yeast like fungi
 - ☐ Dimorphic fungi, Filamentous fungi
 - ☐ Reproduction of fungus

Medically important fungi

- Basic knowledge of medically important fungi and actinomycetes-
- Candida species, Cryptococcus, Sporothrix, Blastomyces, Paracoccidioides brasiliensis, Coccidioides immitis, Histoplasma,
- Agents of Chromomycosis, Penicillium, Fusarium, Cladosporium, Curvularia, Rhizopus, mucor, Aspergillus, Trichoderma species, streptomycetes, Syncephalastrum, Cephalosporium and other medically important fungi.
- Dermatophytes, Agents of piedra, Alternaria, Rhinosporidium Torulopsis, Nocardia, Fonsecaea, Phialophora, Basidiobolus.
- Mycotoxins.

(Emphasis should be given to its morphology. Growth characteristics on Routine culture media and special media if any, tests used for its identification, pathogenicity, laboratory diagnosis and epidemiology prophylaxis.)

Fungal infections

- Basic knowledge of different types of fungal infections its causative agents and its epidemiology.
 - o Superficial mycoses
 - o Subcutaneous mycoses
 - o Systemic mycoses
 - o Opportunistic pathogens and its infections

- o Ophthalmic infection
- Common media and stains used in Mycology
- Culture technique for fungal identification
- Laboratory animals in Mycology
- Special stains in fungus identification
- Types of specimens, its collection, transportation, Preservation and processing for the diagnosis of fungal infections
- Antifungal Susceptibility and its recent developments
- Serological methods for the diagnosis of fungal infection.
- Preservation of fungus

VIROLOGY - 30 hours

INTRODUCTION TO VIROLOGY

- General properties of viruses-Morphology, Replication, effects of viruses on the host cells.
- Principles of virus, Taxonomy and classification.
- An elementary knowledge of medically important DNA and RNA viruses (Classification, Morphology, Pathogenicity, Host range, Methods of Laboratory diagnosis, prophylaxis and epidemiology).
- More emphasis should be given to HBV, HIV, Flavi virus and other common viral infection in India.
- Emerging viral diseases in Kerala

Cultivation of viruses

- Different methods of cultivation and isolation of viruses.
- Animal inoculation
- Embryonated egg inoculation-Anatomy of embryonated egg, Techniques of various routes of inoculation
- Tissue culture techniques
 - Classification with examples
 - Cell culture containers and cleaning
 - Preparation of media, reagents and solutions
 - Propagation, maintenance, preservation of various cell cultures
 - Description of common cell culture
 - Contamination in cell culture
 - Detection of virus growth in cell culture - C.P.E, Metabolic inhibition, Haemadsorption, Interference, Immunofluorescence
 - Cytological and Cytochemical diagnostic methods
 - Inclusion bodies- methods of staining and demonstration

DIAGNOSTIC VIROLOGY

- Collections, preservations, Transportation, Processing, Isolation and identification of the following specimens for viral diagnosis.
 - Skin lesion, Vesicle fluid,
 - Biopsy specimens,
 - C.S.F and other sterile fluids, pus, buffy coat,
 - Nasopharyngeal secretions, sputum,
 - Urogenital specimens
 - Faeces or rectal swab.

Serological diagnosis of viral infection,

- Paul Bunnel test
- Haemagglutination and Haemagglutination inhibition test
- Viral neutralization tests
- Immunofluorescence
- Immunoelectron microscopy

APPLIED MICROBIOLOGY - 30 hours

Nosocomial infections

- Diagnosis and its control
- Infection associated with blood transfusion
- Infection associated with intravascular canula
- Post operative infections
- UTI
- Surgical and trauma related infections
- Respiratory infections and other hospital acquired infections
- Antibiotic resistance in hospitalized patients
- Collection of specimens for sterility tests, its transportation and processing
- Epidemiological aspects of control infections and diseases
- Epidemiological markers in bacterial infections
- Typing methods in Bacteriology
- Microbial bio- film -prevention, control and removal
- Role of microbiology lab for infection control in hospital Emerging infectious diseases
- Collection, transportation and processing of specimens for the diagnosis of Hospital acquired infection

Bacteriology of air

Examination of Air-a brief review of microorganisms causing air borne diseases.

Examination of air in theatre or cabinets. Different methods in detail.

Water bacteriology –

- Bacteriology of drinking water
- Brief review of microorganisms causing water borne infections
- Examination of water- methods of collection of water and processing
- Presumptive coliform count and confirmatory tests
- Membrane filtration methods

Microbiology of milk and milk products

- Milk born infections
- Examination of milk and milk products
- Preparation media and reagents for the study of water, food, milk and air
- Methylene blue test or phosphatase test, colony count test, Milk ring test, Turbidity test, whey agglutination test

Bacteriology of food and food borne diseases –

- Examination of food and food products

- A brief review of microorganisms causing food borne diseases
- Collection of samples and its processing –Frozen food, canned food and preserved food

Automation in diagnostic microbiology-

- Principles and its applications in diagnostic approach

Microbiology Laboratory Physical design

Management and organization Quality in the clinical Microbiology Laboratory

Genetically modified microorganisms

Principles of luminescence assay

Molecular Diagnostic methods

- Molecular diagnostic techniques relevant to medical microbiology. Illustrative knowledge of restriction fragment length polymorphism.
- PCR and its modifications including nested PCR, Multiplex PCR. Special emphasis to Real-time PCR.
- Principles of different hybridization techniques Principles of recombinant DNA technology Blotting techniques
- Vaccines for infectious diseases
- Role of genetic engineering in vaccine developments

Serology

Rheumatoid factor tests

- Rosewaaler test, Latex agglutination test.

Antinuclear antibody tests.

Detection of C-Reactive protein.

Haemolysin production and titration

PRACTICALS 180 Hours

Virology

- o Demonstration of different type of cell lines.
- o Demonstration of egg inoculation,
- o Demonstration of CPE, Inclusion bodies, Paul Bunnel test,
- o Demonstration of Viral Haemagglutination test, Viral Haemagglutination inhibition test, Viral neutralization test,
- o Demonstration of immunofluorescence technique; Electron microscopy

MYCOLOGY

- o Study of growth characteristics, microscopic examination and identification of medically important fungi, collection, transportation and processing of specimens for mycological examination.
- o Slide culture technique
- o Germ tube test for yeast identification

Serology

- Rosewaaler test, Latex agglutination test.
- Antinuclear antibody tests.
- Detection of C-Reactive protein.
Haemolysin production and titration

ELISA

Examination of water- methods of collection of water and processing

Presumptive coliform count and confirmatory tests

Membrane filtration methods

Examination of milk and milk products

Preparation media and reagents for the study of water, food, milk and air

Methylene blue test or phosphatase test, colony count test

Milk ring test, Turbidity test, whey agglutination test

Examination of food and food products

Collection of samples and its processing –Frozen food, canned food and preserved food

PCR technique and its modifications

Text Books

Medical mycology – Rippon

Text Book of Microbiology - Ananthanarayanan&JayaramPanikker

Mackie & Macartney Practical

Medical microbiology - Collee, Fraser, Marmion, Simmons

Bailey and Scott's Diagnostic Microbiology - Forbes Sahn, Weissfeld

Medical Virology - Fenner and White

REFERENCE BOOKS

1	Principles and Practice of Infectious diseases	Mandell, Bennett, Dolin Vol- 1
2	Medical Microbiology	David Greenwood, Slack,
3	Mycology for the Clinical Laboratory	
4	Manual of Clinical Mycology	Conant.N.F., Smith, Baker. R.D
5	Human Infections and Fungi	I Roger Der

Paper XV – HISTOTECHNOLOGY & CYTOGENETICS

90 – HOURS

Topic

HISTOTECHNOLOGY 70 Hours

Histopathological Techniques

- General understanding of the terms – Histology, Histopathology and Histopathological techniques.
- General organization of a Histopathology laboratory and basic requirements for a histopathology laboratory. Role of Histopathology laboratory in the diagnosis of diseases.
- Reception of specimens, identification and recording in the Registers, General introduction to the processing of tissues.
- Methods of examination of Fresh tissue specimens-Teased preparations, squash preparations, impression smears and frozen sections.

Fixation

- Aim of fixation. Qualities of fixatives. Classification of fixatives. Formalin fixative. Advantages and disadvantages of formalin fixatives. Methods of removing formalin pigment and deposits from cut sections. Use, advantages and disadvantages of other simple fixatives like mercuric chloride, potassium dichromate, chromic acid, osmium tetroxide, picric acid, Acetic acid Ethyl alcohol and Trichloroacetic Acid, Composition, uses, advantages and disadvantages of 10% Formol Saline, Buffered Neutral Formalin, Mercuric chloride.
- Choice of Fixatives, Composition uses advantages and disadvantages of Zenker's fluid, Bouins fluid Carnoys fixatives, Hellys fluid, Heidenhain's Susa, Clark's fluid, Flemming's fluid, Champy's fluid, Zenker's formol and Mullers fluid

different histochemical fixatives, their merits and demerits

- Post Chromatization, Secondary fixation.

Tissue Processing

- Dehydration, aim of dehydration, various dehydrating agents employed, their merits and demerits. Technique of dehydration clearing – aim of clearing, various clearing agents, their advantages and disadvantages.
- Impregnation – need and time requirement for impregnation and technique of paraffin wax impregnation.
- Principles, operation, parts and care of automatic tissue processors
- Special processing techniques: Fixation, processing and section cutting of bones, cartilages, connective tissue, CNS, pancreas, skin, teeth and eyeball.

Decalcification

Aim of decalcification, selection of tissue, Fixation of tissue, various decalcifying agents used, decalcification techniques – end point determination and qualities of ideal decalcifying agents.

Embedding

Different types of embedding media, advantages disadvantages. Method of embedding, principles uses advantages of vacuum embedding. Uses, advantages and disadvantages of Ester wax embedding, gelatin embedding, Cello din embedding, double embedding and embedding using water. Resin embedding.

Casting/Blocking

- Types of moulds used. Technique of casting

Sectioning

- Different types of Microtome: - Rocking, Rotary, sledge, sliding and freezing microtome. Their operations and specifications. Different types of microtome knives, knife angle. Choice and care of knives. Sharpening of microtome knives, honing and different types of hone employed and honing technique. Stropping and different types of stropps employed and techniques of stropping. Parts care and operation of automatic knives sharpening machine.
- Cutting of paraffin wax embedded sections: - Trimming of blocks, fixing the block on the microtome. Technique of sections cutting. Cutting serial sections recognition and correction of faults in paraffin sections.
- Fixation of sections to slides- water bath method, hot stage method and warmed slide method.
- Cutting of celloidin embedded section – Fixing of celloidin embedded sections on slides.
- Preparation and use of albuminised and starched slides.

Staining

- Principles and Theory of staining, Biological staining, Basic staining technique. Classification of dyes. Principle of dye chemistry. Mordents, accentuators and accelerators. Uses of controls in staining procedure.
- Haematoxylin : - composition, preparation, uses, staining results advantages

and disadvantages of all the different haematoxylin.

- Principle, preparation, storage, staining technique observation and interpretation of Haematoxylin and eosin stain.

Staining methods of following in tissue sections.

- Carbohydrates
 - Glycogen
 - Mucins – acid & neutral.
- Lipid – myelin.
- Pigments
 - Endogenous – haemosiderin, bile pigment, melanine, lipofuscins. Artifact - formalin, malarial, schistosome, mercury, chromic oxide.
- Minerals – Calcium, Copper.
- Connective tissues – collagen, reticular, elastic.
- Fibrin.
- Muscle striations.
- Microorganisms – bacteria, AFB, fungi, viral inclusion-HBs Ag

Advanced techniques in Histopathology

- Cryostat and their uses. Principle, care and operation of cryostat.
- Automation in histopathology
- Immuno cytochemistry and its application.
- Enzyme histochemistry, Immunofluorescent techniques in tissue sections.
- In situ hybridization.
- Electron microscopy- processing and Techniques.

Postmortem room Technique

- Collection and preservation of tissue, collection of materials for laboratory studies

Museum Technique

General introduction, organization of a museum. Source of materials, need for preservation and mounting, Reception, preparation, labeling, fixation of various specimens and organs, storage of specimen, mounting of museum specimens, museum jars, perplex and glasses, their advantages and disadvantages, Demonstration of Bone, calculi, Transparent specimen (Fetal skeleton) amyloid. Modern methods in museum technique.

Topic

CYTOGENETICS - 20 hours

- Human sex chromosomes.
- Sampling staining and demonstration of Barr body. Reporting and interpreting Barr test.
- Demonstration of Y-chromosome, Origin and demonstration of drumstick, small clubs, sessile nodules and balloons. Drumstick count and its interpretation.

Karyotyping

- Methods of Chromosome analysis
- Banding techniques.
- Chromosome analysis with blood and bone marrow. Morphology of chromosome and their identification. Criteria for chromosome identification. Identification criteria of group to group of chromosome. Conventional designation.

Chromosome Defects

- Physiologic factors are influencing the aetiology of chromosome defects, Types of chromosome defects- Structural abnormalities and human autosomal syndromes. Philadelphia chromosome and chromosome changes in Neoplasia, abnormalities of sex chromosome at birth, at puberty and in adults.
- Turner's syndrome, Down's syndrome, Klinefelter syndrome,
- Advanced methods in cytogenetic – FISH, SKY.
- Clinical utility of Bone Marrow culture.

Practical 180 HOURS

- Preparation of commonly used fixatives- Formalin, Bouin's, Zenker's, Carnoy's
- Automatic tissue processors
- Decalcification
- Embedding
- Section cutting
- Cryostat section cutting
- Preparation of haematoxylin stains- Harri's, Ehrlich's, Mayer's, Weigert's, PTAH, Verhoeff's
- Special stains- PAS, Perl's, Reticulin, Vangieson, Masson Trichrome, Verhoeff's elastic stain, Masson Fontana, Alcian blue, AFB, Wade- Fite, Methenamine stain, Von Kossa, PTAH, Oil red O stain, Mucicarmine stain.
- Chromosome preparation
- Karyotyping
- Preparation of karyotype from bone marrow specimen
- Barr body demonstration

TEXT BOOK

Hand book of histopathological techniques- CFA culling

BOOKS RECOMMENDED FOR REFERENCE

1	Basic Histology	L.C. Junquera
2	Manual of Histological staining AFTP Fascicle 3 rd Edition Reprinted 1982	
3	Lynch's Medical Laboratory Technology	Raphael
4	Self Assessment in Histological Techniques	Bancroft
5	Manual of Histological Techniques	Bancroft
6	Histopathology – A step-by-step approach	Lewis
7	Basic Histopathology	Wheather
8	Colour Atlas of Histopathology	Curran
9	Cellular pathology technique	5 th Edition

BOOKS RECOMMENDED FOR CYTOGENETICS

1. Human Chromosomes- Manual of basic techniques – Ram . S. Verma, Arvid Babu.
2. Cytogenetics, FISH and molecular testing in hematologic malignancies – Wojciech Gorczyca

Paper XVI

150 Hours

Project

Submission of a Project work is a compulsory requirement for the B Sc MLT – course. Each student can choose a topic for the project in any one of the subjects – Microbiology/Biochemistry/Pathology which would be approved by his/her supervising teacher. The topics for project shall be divided equally among total number of students from the three main subjects Microbiology/Biochemistry/Pathology.

The option for topics selection for the project will be based on the following criteria

- Total marks obtained in all the previous university examinations up to 3rd year.
- If total marks obtained equal for more than one student then marks obtained for the optional subject may be considered.

The supervising Teacher should have minimum 3 years full time teaching experience in the concerned subject. The student should be under the guidance of the supervising staff, carry out the work on the topic selected and prepare a project report including results and references. The project report

duly certified by the supervising staff and head of the department of MLT one month prior to fourth year university practical examination should be submitted to the fourth year B Sc MLT University practical examination of concerned subject.

The project report evaluation will be conducted by the concerned subject internal and external examiners together in the Fourth year B Sc MLT University practical examination.

2.11. No: of hours per subject

As given under clause “Teaching learning methods “& “Content of each subject in each year “

2.12. Practical training

As given under clause “Teaching learning methods “& “Content of each subject in each year “

2.13 Records

To be maintained for all Practical Work

2.14. Dissertation:

Not Applicable

2.15. Speciality training if any

As given under clause “Teaching learning methods “& “Content of each subject in each year “

2.16. Project work to be done if any

Project

Synopsis

A project work based on clinical laboratory work on a current topic of relevance, consisting of about 30 pages (Times New Roman, Font size 14, line space 1.5), bound.

Submission

The project should be certified by the supervising staff and submitted to the Head of the Department one month prior to fourth year university practical examination and a soft copy of the certified project should be submitted to the controller of examinations of KUHS during the time of registration for fourth year BSc (MLT) examination.

Valuation of Project

The project report evaluation will be conducted by the internal and external examiners together in the concerned subject of Fourth year B Sc MLT University practical examination. Soft Copy of the project should be sent to the examiners at least one week before the date of examination by KUHS.

Candidate who has secured a minimum of 50% marks in the University examination (theory and practical separately) and 50% marks in Total for theory block (University theory examination and internal assessment) and 50% in practical block (University Practical, Viva & Internal assessment) separately in any subject or subjects shall be declared to have passed in that subject / subjects. There will be no minimum marks for viva examination. A candidate who fails in any subject or subjects in the examination may need to appear the theory, practical and viva for that subject or subjects in the subsequent supplementary or regular university examination. Five marks may be given as grace mark (or as per KUHS regulations) either in a subject alone or distribute it among subjects so as to make the candidate eligible for a pass.

2.17. Any other requirements

A certified practical Record is compulsory for each subject and that will be evaluated at the time of concerned Practical Examination. A maximum of 10 marks shall be given for the record.

2.18. Prescribed/recommended textbooks for each subject

As given under clause "Teaching learning methods "& "Content of each subject in each year "

2.19. Reference books

As given under clause "Teaching learning methods "& "Content of each subject in each year "

2.20. Journals

As decided by the HoD

2.21. Logbook

To be maintained for all academic work and shall be countersigned by the concerned HOD

3. EXAMINATIONS

3.1 Eligibility to appear for exams

a) Attendance and condonation option.

Minimum of 80% attendance is required for appearing in the examination . Regarding condonation of shortage of attendance clause 1.9 shall apply.

If a candidate who has not attained 80% attendance and the shortage is beyond the condonable limit then he/ she shall not be eligible to continue the course with the same batch of students. He/ She may obtain special sanction from the institution and the university to continue with the junior batch of students.

b) Internal Assessment marks.

The internal assessment marks in theory/Practical shall be restricted to a maximum of 25% of the University Examinations in Theory/Practical separately. The internal assessment marks in theory/Practical shall be on the basis of the assessment made by the teachers from the candidate's performance in the: Three (3) sessional examinations (evenly placed) conducted by the department, Laboratory work and seminars during the course of study.

The third sessional examination should be conducted as model examination as that of University and is mandatory .

The average of best two Sessional examinations shall be taken as the internal assessment marks.

The marks secured by the candidates in each paper/subject shall be forwarded to the university at the end of the course for university examinations. The class average of the sessional marks should not exceed 75%.

The candidates who failed in the university examination will be allowed a separate internal assessment for both theory and practical including viva.

The minimum requirement of internal assessment marks for appearing university examination shall be 50%. If a candidate not securing minimum internal assessment marks he / she should appear for next university examination (supplementary or regular) after securing the minimum internal assessment. A regular record of theory and practical sessional marks shall be maintained for each student in the institution. A separate internal assessment examination shall be conducted for theory and practical for the failed candidates who appear for the supplementary examination and that marks will be taken as the internal marks of that candidate for that subject.

c) University Examinations.

There shall be university regular examination at the end of each Academic year; in case of failed/not appeared candidates a supplementary examination will be conducted within six months after the publication of results of previous regular examination.

Candidates who fail in one or more papers in an examination need to appear for only those papers for securing complete pass in the examination. Those who fails either in theory or practical of a subject shall have to appear for both theory and practical.

There will be no University practical and viva examination for Paper –I Anatomy & Physiology and for paper XII- Research methodology, Computer application & Laboratory management. There will be no practical internal assessment, but practical classes should be conducted for these papers as per the hour distribution table.

d) Practical record.

A certified practical Record is compulsory for each subject and that will be evaluated at the time of concerned Practical Examination. A maximum of 10 marks shall be given for the record.

3.2 Schedule of Regular/Supplementary exams

There will be one regular and one Supplementary examination. Regular Examination shall be conducted within 6 months after from the date of declaration of results

3.3 Scheme of examination

a) The following rule may be followed when distributing mark

Paper 1		
Theory	Paper I A (Anatomy)	50 Marks
	Paper I B (Physiology)	50 Marks
Sessional marks		
Internal Marks Theory	Paper I A (Anatomy)	12 Marks
	Paper I B (Physiology)	13 Marks
Other Papers		
Theory		100 marks
Practical		First year and second year—100 Third year and fourth year - 150 marks (10 marks for Record)
Oral		--50 marks
Sessional marks		
Theory		--25 marks
Practical		--25 marks

b) The detailed scheme of mark distribution in each subject is shown in the table
First Year BSc MLT

Paper	Theory						Practical						Grand Total		
	University		Sessional		Total		University		Sessional		viva	Total			
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
Paper-I	100	50	25	12.5	125	62.5	-	-	-	-	-	-	-	125	62.5
Paper-II	100	50	25	12.5	125	62.5	100	50	25	12.5	50	175	87.5	300	150
Paper-III	100	50	25	12.5	125	62.5	100	50	25	12.5	50	175	87.5	300	150
Paper-IV	100	50	25	12.5	125	62.5	100	50	25	12.5	50	175	87.5	300	150
Total Marks													1025	512.5	

Second Year

BSc MLT

Paper	Theory						Practical						Grand Total		
	University		Session		Total		University		Session		viva	Total			
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
Paper-V	100	50	25	12.5	125	62.5	100	50	25	12.5	50	175	87.5	300	150
Paper-VI	100	50	25	12.5	125	62.5	100	50	25	12.5	50	175	87.5	300	150
Paper-VII	100	50	25	12.5	125	62.5	100	50	25	12.5	50	175	87.5	300	150
Paper-VIII	100	50	25	12.5	125	62.5	100	50	25	12.5	50	175	87.5	300	150
Total Marks													1200	600	

Third Year BSc MLT

Paper	Theory						Practical							Grand Total	
	University		Session		Total		University		Session		viva	Total			
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
Paper-IX	100	50	25	12.5	125	62.5	150	75	25	12.5	50	225	112.5	350	175
Paper-X	100	50	25	12.5	125	62.5	150	75	25	12.5	50	225	112.5	350	175
Paper-XI	100	50	25	12.5	125	62.5	150	75	25	12.5	50	225	112.5	350	175
Paper-XII	100	50	25	12.5	125	62.5	-	-	-	-	-	-	-	125	62.5
Total Marks													1175	587.5	

Final Year BSc MLT

Paper	Theory						Practical							Grand Total	
	University		Session		Total		University		Session		viva	Total			
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min		Max	Min	Max	Min
Paper-XIII	100	50	25	12.5	125	62.5	150	75	25	12.5	50	225	112.5	350	175
Paper-XIV	100	50	25	12.5	125	62.5	150	75	25	12.5	50	225	112.5	350	175
Paper-XV	100	50	25	12.5	125	62.5	150	75	25	12.5	50	225	112.5	350	175
Paper XVI Project							50							50	25
Total Marks													1100	550	

3.4. Papers in each year:

As given under clause "Teaching learning methods "& "Content of each subject in each year "

3.5. Duration of theory and practical exams

Year of study	Paper	Subject	Duration of exam		Description
			Theory (Hours)	Practical (Days)	For practical examination one batch comprises maximum of 25
First Year	Paper-I A	Anatomy including Histology	2	-	No practical exam for anatomy & physiology. Theory examination- 1 day for anatomy &
	Paper-I B	Physiology	2	-	
	Paper-II	Biochemistry-I	3	1	
	Paper-III	Basic Microbiology & Immunology	3	1	
	Paper-IV	Basic Medical Laboratory Science & Haematology – I	3	1	
Second	Paper-V	Biochemistry-II	3	1	
year	Paper-VI	General Microbiology	3	2	In case of two batches, Practical exam in paper- VI can be completed in 3 days. (1 st & 2 nd day for first batch and 2 nd & 3 rd day for second batch.)
	Paper-VII	Parasitology & Entomology	3	1	
	Paper-VIII	Haematology-II & Clinical Pathology	3	1	
Third	Paper-IX	Biochemistry -III	3	2	
	Paper-X	Bacteriology	3	3	In case of two batches, Practical exam in paper - X can be completed in 4 days. (1 st , 2 nd & 3 rd day for first batch and 2 nd , 3 rd & 4 th day for second batch.)

	Paper-XI	Cytology and Transfusion technology	3	2	In case of two batches, Practical exam in paper - XI can be completed in 3days. (1 st &2 nd day for first batch and 2 nd &3 rd day for second batch.)
	Paper-XII	Computer Application, Research methodology & Laboratory management.	3	-	No practical exam for Paper- XII
Fourth year	Paper- XIII	Biochemistry-IV	3	3	In case of two batches, Practical exam in paper – XIII &XIV can be completed in 4 days. (1 st , 2 nd & 3 rd day for first batch and 2 nd , 3 rd & 4 th day for second batch.)
	Paper - XIV	Mycology, Virology & Applied Microbiology	3	3	
	Paper XV	Histotechnology & Cytogenetics.	3	2	
	Paper XVI	Project			Power point presentation & viva of the project for a

Question Paper setting and evaluation

c) Question Paper pattern

All the question paper should be of standard type. Each theory paper will be of 3 hours duration and shall consist of twenty two questions with a maximum of 100 marks. Theory paper in all the subjects shall consist of Two essay type questions with 10 marks each, Ten brief answer type questions carrying 5 marks each, Ten short answer type questions carrying 3 marks each except in Paper - I Paper I (Anatomy and Physiology) consist of two divisions named as Paper I A - Anatomy including Histology and Paper I B - Physiology. Each division carries 50 marks and shall consist of one essay type question with 10 marks, five brief answer type questions carrying 5 marks, five short answer type questions carrying 3 marks. Also examination in paper I A and Paper I B will be conducted separately in 2 days. The Maximum duration allowed for Paper I A and Paper I B is 2 hours each.

Valuation of Project

The project report evaluation will be conducted by the internal and external examiners together in the concerned subject of Fourth year B Sc MLT University practical examination. Soft Copy of the project should be sent to the examiners at least one week before the date of examination by KUHS.

Candidate who has secured a minimum of 50% marks in the University examination (theory and practical separately) and 50% marks in Total for theory block (University theory examination and internal assessment) and 50% in practical block (University Practical, Viva & Internal assessment) separately in any subject or subjects shall be declared to have passed in that subject / subjects. There will be no minimum marks for viva examination. A candidate who fails in any subject or subjects in the examination may need to appear only for that subject or subjects in the subsequent supplementary or regular university examination.

Five marks (or as per university regulations) may be given as grace mark either in a subject alone or distribute it among subjects so as to make the candidate eligible for a pass.

3.6 Model question paper for each subject with question paper pattern

QP CODE: 101012

Reg. No.

First Year B.Sc. MLT Degree Examinations, September 2014

Paper I A - ANATOMY INCLUDING HISTOLOGY

Time: 2 Hours

Total Marks: 50

Essay

Answer all Questions. Draw Diagrams wherever necessary. •Write the Answers in books containing 32 Pa

1. Describe the respiratory system under the following headings:

• Parts • Relations • Microscopic anatomy of lungs

•Broncho pulmonary segments (2+3+2+3=10)

Short notes

(5x5=25)

2. Liver
3. Synovial joint
4. Microscopic structure of kidney
5. Prostate
6. Right atrium

Answer briefly

(5x3=15)

7. Fallopian tube
8. Thymus
9. Neuron
10. Vermiform appendix
11. Deltoid muscle.

QP CODE: 102012

Reg. First Year

B.Sc MLT Degree Examinations, September 2014

Paper I B - PHYSIOLOGY

Time: 2 Hours

Total Marks: 50

Answer all Questions. Draw Diagrams wherever necessary.
Write the Answers in books containing 32 Pages.

Essay

(10 marks)

1. Define blood pressure. Explain the short term regulation of blood pressure. Describe any one method of determination of blood pressure (2+5+3=10)

Short notes

(5X5=25 marks)

2. Oxygen dissociation curve
3. Pain pathway
4. Water re-absorption in renal tubule
5. T-lymphocytes
6. Deglutition

Answer briefly

(5x3=15marks)

7. Pregnancy test
8. Parathormone

- 9. Plasma proteins
- 10. Functions of placenta
- 11. Tidal volume

QP CODE: 103012

RegNo:..... First B.Sc

MLT Degree Examinations, September 2016

PAPER II . BIOCHEMISTRY-I

Time: 3 Hours

Total Marks: 100

Answer all Questions.
Draw Diagrams wherever necessary.

Essay

(2x10=20)

- 1. Enumerate the various hazards that can occur in a clinical lab and discuss about the hazards from dangerous chemicals . (3 + 7 = 10)
- 2. What are the different levels of organization of proteins. Discuss the primary structure of proteins with suitable example . (2 + 8 =10)

Short notes

(10x5=50)

- 3. Fluorimetry
- 4. Functions of lipids.
- 5. Flame photometry.
- 6. Glucose transporters.
- 7. Denaturation of proteins.
- 8. Structure of biomembrane.
- 9. Structure and functions of t RNA.
- 10. Active transport across cell membrane.
- 11. Preparation of 500ml of 0.1M silver nitrate.
- 12. Preparation of cleaning solution for biochemical glass wares in a clinical lab.

Answer briefly

(10x3=30)

- 13. Histones.
- 14. Lysosomes
- 15. Distilled water.
- 16. Rancidity of fat.
- 17. Oxidation of glucose.
- 18. Anomerism in sugars
- 19. Units of radio activity.
- 20. Composition of borosilicate glass wares.
- 21. Muta rotation and its practical importance.
- 22. Define normality. Mention the procedure for preparation of 100 ml of 1N HCl.

QP CODE: 104012

Reg No:

First Year B.Sc. MLT Degree Examinations.2016

Paper III- Basic Microbiology & Immunology

Time: 2 Hours

Total Marks: 100

Answer all questions & Draw diagrams wherever necessary

Essay

(2x10=20)

- 1) Define sterilization. What are the different methods of sterilization?
Write in detail about moist heat sterilization. (1+3+6=10Marks)
- 2) Classify Immunoglobulins. Discuss the structure and functions of immunoglobulins.
(1+9=10Marks)

Short notes

(10x5=50)

- 3) Robert Koch
- 4) Safety cabinets
- 5) Bacterial flagella.
- 6) ELISA
- 7) Differentiate Gram positive and negative cell wall
- 8) Vaccines.
- 9) Monoclonal antibody
- 10) Classical complement pathway.
- 11) Hypersensitivity reactions
- 12) Lymphocyte subsets

Answer Briefly

(10x3=15)

- 13) Sintered glass filters
- 14) Negative staining
- 15) In-use test
- 16) Different types of Membrane filters
- 17) Chemo sterilizer
- 18) Super antigens
- 19) Agglutination reactions

- 20) AFB staining
- 21) Neutralisation test
- 22) interferon

QP CODE: 105012

Reg No:

First Year B.Sc. MLT Degree Examinations.2016
Paper IV. Basic Medical Laboratory Science & Haematology – I

Time: 2 Hours

Total Marks: 100

Answer all questions
Draw diagrams wherever necessary

Essay **(2x10=20)**

1. Define differential leucocyte count. Write the preparation & uses of different types of blood smears (2+8=10 marks)
2. Mention different types of microscopes. Describe aberrations of light microscope.
Describe the principle working & applications of Dark ground microscope (2+3+5=10 marks)

Short notes **(10x5=50)**

3. Platelet count
4. ESR
5. Red cell indices
6. Romanowsky stains
7. Diluting fluids
8. Goals & Scopes of Medical ethics
9. Laboratory hazards
10. Micrometry
11. Total WBC count
12. Cyanmethaemoglobin method (10x5=50marks)

Answer Briefly **(10x3=15)**

13. PCV
14. Reticulocyte
15. Citrate as anticoagulant
16. Red cell indices
17. Buffy coat smears
18. Demonstration of HbF

19. Principles of automated cell counters

20. Preparation of bone marrow smears

21. Vacutainers

22. Megakaryocyte

(10x3=30marks)t

QP Code:201012

Reg. No.

**SECOND YEAR BSc MLT EXAMINATION (Model
Question Paper)**

Paper- V. Biochemistry - II

Time: 3 hrs

Maximum marks: 100

Answer all questions

Draw diagrams wherever necessary

Essays

(2x10=20)

1. Discuss briefly the De novo synthesis of purine nucleotides (10)

2. Discuss various methods of cholesterol estimation. Write any one method in detail
(4+6=10)

Short Notes

(10x5=50)

3. CSF analysis

4. Gluconeogenesis

5. Urea cycle

6. Phenyl ketonuria

7. Energetics of TCA cycle

8. Important compound synthesized from tryptophan

9. Fatty liver

10. Bile acid synthesis

11. Biuret method of total protein estimation

12. Functions of vitamin A

Answer Briefly

(10x3=30)

13. Cori's cycle

14. Significance of HMP pathway

15. Galactosemia

16. Polyamine synthesis

17. Role of vitamin K in coagulation

18. Functions of vitamin C

19. Niemann - Pick disease

20. Biosynthesis of phosphatidyl serine

21. Role of biotin in fatty acid synthesis

22. Glucuronic acid pathway

QP Code: 202012

Reg. No.:

**SECOND YEAR BSc MLT EXAMINATION (Model
Question Paper)**

Paper- VI. General Microbiology

Time: 3 hrs

Maximum marks: 100

Answer all questions

Draw diagrams wherever necessary

Essays

(2x10=20)

1. Enumerate bacterial enzymes detected in your lab. Discuss in detail. (2+8=10)
2. Enumerate the different methods of transmission of genetic material in bacteria. Describe each. (2+8=10)

Short notes

(10x5=50)

3. TSI
4. Modern anaerobic culture methods
5. typing of bacteria
6. selective media
7. classification of microorganisms
8. Germ free animals
9. Guinea pig
10. Euthanasia in lab animals
11. Lac operon
12. Turbidometric method of measuring bacterial growth

Answer briefly

(10 x3=30)

13. RCM
14. Enrichment media
15. Chocolate agar
16. Of test
17. PPA test
18. Postmortem examination of animals
19. Disposal of carcasses
20. Solidifying agents in culture media
21. Isolation of bacterial mutants
22. Genotypic and phenotypic variations in bacteria

QP Code: 203012

Reg. No.

**SECOND YEAR BSc MLT EXAMINATION (Model
Question Paper)**

Paper- VII. Parasitology and Entomology

Time: 3 hrs

Maximum marks: 100

Answer all questions

Draw diagrams wherever necessary

Essays

(2x10=20)

1. Describe the morphology life cycle pathogenesis clinical features and laboratory diagnosis of malaria (10)

2. Classification of insects of medical importance. Discuss briefly binomics of anopheles (7+3=10)

Short Notes

(10x5=50)

3. Hydatid cyst
4. Schistosoma haematobium
5. Toxoplasma gondii
6. Pathogenic free living amoeba
7. Laboratory diagnosis of kala-azar
8. Transmission of infection by insects
9. Insecticides and resistance
10. Cyclops and its control
11. Sarcoptes scabiei
12. Mosquito control measures

Answer Briefly

(10x3=30)

13. Bile stained ova
14. Diphylobothrium latum
15. Balantidium coli
16. Trichomonas vaginalis
17. Xeno diagnosis
18. Integrated vector control
19. Head louse
20. Biological control
21. Life cycle of hard tick
22. Rat flea

QP Code: 204012

Reg. No :.....

**SECOND YEAR BSc MLT EXAMINATION (Model
Question Paper)**

Paper- VIII. Haematology and Clinical Pathology

Time: 3 hrs

Maximum marks: 100

Answer all questions

Draw diagrams wherever necessary

Essays

(2x10=20)

1. Define leukemia. Classify it. Explain the blood and bone marrow findings in CML
(2+3+5=10)
2. What is HCG. Mention HCG levels at various stages of pregnancy. Explain different card tests used for the detection of pregnancy. (1+4+5=10)

Short Notes

(10x5=50)

3. Urine preservatives
4. Prothrombin time
5. Bence Jones protein
6. Examination of blood for parasites
7. Hbs
8. Fibrin degradation products
9. Laboratory diagnosis of iron deficiency anaemia
10. Semen analysis
11. Leukaemiod reactions
12. Myeloperoxidase stain

Answer briefly

(10x3=30)

13. Detection of ketone bodies in urine
14. Bleeding time
15. Fouchet's test
16. CSF cell count
17. Measurement of faecal fat
18. Haemoplilia
19. Occult blood in stool
20. Organised sediments of urine
21. Automated blood cell counter
22. Ham's test

Q.P.Code:301012

Reg.no Third

year BSc MLT Degree Examinations 2016

Paper IX . BIOCHEMISTRY III

Time: 3Hours

TotalMarks:100

- Answer all questions
- Draw diagrams wherever necessary

Essays:

(2x10=20)

1. Discuss the basic principle of Chromatography. Write the detailed procedure for separation of urinary Amino acid by Chromatography. (2 +8=10)
2. Describe the biosynthesis of Heme synthesis. Add a note on its regulation (8+2=10)

Short notes:

(10x5=50)

3. Bohr effect
4. Isoenzymes of Alkaline phosphatase
5. SDS-PAGE
6. Estimation of serum Bilirubin
7. Co-enzymes
8. Acute intermittent porphyria
9. Factors affecting the electrophoretic mobility
10. Common laboratory investigations for porphyrias
11. Affinity Chromatography
12. Urinary calculi analysis

Answer briefly:

(10x3=30)

13. Glucose -6-phosphate dehydrogenase
14. K m Value of enzymes
15. Active site of enzymes
16. Suicide inhibition
17. Creatine kinase
18. Isoelectric focussing
19. Foetal Haemoglobin
20. Significance of Transaminases
21. Crigler-Naajar syndrome
22. Fluorescent immunoassay

Q.P.Code: 302012

Reg.No.:.....

Third year BSc MLT Degree Examinations 2016

Paper X. BACTERIOLOGY

Time:3 Hours

Total Marks:100

- Answer all questions
- Draw diagrams wherever necessary

Essays: (2x10=20)

1. Enumerate the bacteria causing pyogenic meningitis. Write in detail the Laboratory diagnosis of Pneumococcal meningitis (2+8=10)
2. Classify the serological tests used to diagnose syphilis. How do you diagnose a case of syphilis in a laboratory (2+8=10)

Short notes: (10x5=50)

3. CAMP test
4. Gas gangrene
5. Diarrhoeogenic Escherichia coli
6. Disc diffusion method of sensitivity tests
7. Laboratory diagnosis of Cholera
8. Processing of sputum for isolating Mycobacterium tuberculosis
9. Helicobacter pylori
10. Selective and Enrichment media for salmonella and Shigella
11. Preservation of bacteria.
12. Mycoplasma pneumoniae.

Answer briefly: (10x3=30)

13. McFaydean reaction.
14. Diene Phenomenon
15. Significant bacteriuria
16. Chigger borne typhus
17. Rat bite fever
18. Sulphur granules
19. Lyme disease
20. Cell wall active antimicrobial agents
21. Lepromin test
22. ASO test

Q.P.Code: 303012

Reg.No:.....

Third year BSc MLT Degree Examinations 2016

Paper XI . CYTOLOGY & TRANSFUSION TECHNOLOGY Time:

3Hours

Total Marks:100

- Answer all questions
- Draw diagrams wherever necessary

Essays:

(2x10=20)

1. Explain the techniques of collection of various samples from respiratory tracts. Enumerate the advantages & disadvantages of each sample. (5+5=10)
2. Mention different components used in blood bank. Explain preparation & use of FFP. (3+ 7=10)

Short notes:

(10x5=50)

3. Cell block
4. Storage of blood in blood bank
5. FNAC
6. Fixatives used in cytology
7. Plasma pheresis
8. Papanicolaou staining
9. Bombay blood group
10. Cross matching
11. Blood grouping sera
12. Quality control in cytology

Answer briefly:

(10x3=30)

13. Lectins used in blood bank
14. Cell cycle
15. Mailing of smears in cytology
16. LISS
17. DU Antigen
18. Processing of fluids in cytology
19. Transfusion transmitted diseases
20. Pre-fixation of cytological specimens
21. Dangerous O group
22. Cytocentrifuge

Q.P.Code:304012

Reg. no.

Third year BSc MLT Degree Examinations 2019

Paper XII. COMPUTER APPLICATIONS, RESEARCH METHODOLOGY, BIostatISTICS
& LABORATORY MANAGEMENT

Time:3 Hours

Total Marks:100

- Answer all questions
- Draw diagrams wherever necessary

ESSAY

(2x10=20)

1. Define Correlation and regression . Describe the method of measuring correlation
(3+3+4=10 marks)
2. How are charts useful in Excel? Compare any three chart types available in Excel
(4 +6=10)

Short notes

(10x5=50)

3. Quality improvement tools
4. Statistical Hypothesis
5. Collection, transportation and disposal of radioactive waste
6. Merits and demerits of Random sampling
7. Types of operating system
8. Basic guide lines for value educations
9. Different steps involved in research process
10. Ethical issues in qualitative research
11. Application of computer in clinical settings
12. NABL guidelines

Answer briefly

(10x3=30)

13. Types of probability
14. personal protective equipment
15. Psychological impact of management
16. Fourth generation computers
17. Editing a document file
18. Common health care associated infections
19. What is text formatting
20. WAN
21. Define information management
22. Coefficient of variation

QP Code: 401012

Reg. No.:.....

FOURTH YEAR BSc MLT DEGREE EXAMINATION-2016 (Model

Question Paper)

PAPER. XIII. Biochemistry - IV

Time: 3 hrs

Maximum marks: 100

Answer all questions

Draw diagrams wherever necessary

Essays

(2x10=20)

1. Describe the different mechanisms by which acid base balance is maintained in our body.
2. Explain the iron metabolism in the body and its disorders

Short Notes

(10x5=50)

3. Mutations
4. Genetic code
5. Post translational modification
6. Calcium homeostasis
7. Inhibitors of transcription and translation
8. Glomerular function tests
9. 17-ketosteroids
10. Levy-Jenning chart
11. Discrete auto analyzers
12. Estimation of VMA

Answer Briefly

(10x3=30)

13. Wilson's disease
14. D-xylose test
15. Phosphorus estimation
16. Serum electrolytes
17. Hepatic jaundices
18. Cardiac profile
19. Pre-analytical variables
20. Urinary oestriol
21. Blood gas analysis
22. Anterior pituitary hormones

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FOURTH YEAR BSc MLT DEGREE EXAMINATION 2016

(Model Question Paper)

PAPER. XIV. Mycology, Virology and Applied Microbiology

Time: 3 hrs

Maximum marks: 100

Answer all questions

Draw diagrams wherever necessary

Essays

(2x10=20)

1. Enumerate hepatitis viruses. Explain the laboratory diagnosis of viral hepatitis (1+9 =10)
2. Define nosocomial infections. Enumerate the etiological agents, laboratory diagnosis and control of nosocomial infections (1+2+5+2=10)

Short notes

(10x5=50)

3. Dermatophytes
4. Dimorphic fungi and its infections
5. Automation in microbiology
6. Confirmatory tests for HIV infection.
7. Bacteriological examination of water sample
8. Detection of viral growth in cell culture.
9. Rhinosporidiosis
10. Dengue fever
11. Antinuclear antibody tests
12. PCR and its application in diagnostic microbiology

Answer briefly

(10 x3=30)

13. Otomycosis
14. Rabies vaccine
15. Epstein barr- virus
16. Prions
17. Settle plate method
18. Corn meal agar
19. RFLP
20. Methylene blue reduction test
21. Kyasanur forest disease
22. Calcofluor white staining

FOURTH YEAR BSc MLT DEGREE EXAMINATION-2016 (Model

Question Paper)

PAPER. XV . Histotechnology and Cytogenetics

**Time: 3 hrs
100**

Maximum marks:

*Answer all questions
Draw diagrams wherever necessary*

Essays

(2x10=20)

1. Explain the principle, procedure and applications of immunohistochemistry
(2+5+3 =10)
2. Explain the steps involved in the metaphase preparation from blood and bone marrow specimens

Short Notes

(10x5=50)

3. Decalcification
4. Museum technique
5. Microtome
6. Cleaning agents
7. Connective tissue stains for collagens
8. Klinifilter's syndrome
9. FISH
10. Immuno fluorescent technique in histopathology
11. Chromosomal changes in cancers
12. Grouping of human chromosomes

Answer Briefly

(10x3=30)

13. Dehydrating agents
14. Turner's syndrome
15. Mitogens
16. 'Y' bodies
17. GTG banding
18. Section adhesive
19. Resin embedding media
20. Demonstration of melanin in tissues
21. Cryostat
22. Histokinitte

Model of scheme for Biochemistry Practical examination.

Year& Paper	Exercise	Marks
1 st year – Biochemistry-I	1.Record	10
	2.Identification of Carbohydrate /protein.	50
	3.Volumetric analysis of NaOH/HCl/H ₂ SO ₄ /Na ₂ CO ₃ /KMnO ₄ /AgNO ₃ . <i>(Any one of the tests may be given to each student on random basis)</i>	40
	Total	100
2 nd Year- Biochemistry-2	1.Record	10
	2. Standard curve preparation with test analysis- Glucose/Urea/Creatinine/Uric acid/ Cholesterol/Proteins. <i>(Any one of the tests may be given to each student on random basis)</i>	50
	3.Vitamin C /Vitamin A/GTT/ GCT/ Urine analysis- abnormal constituents/ CSF biochemistry. <i>(Any one of the tests may be given to each student on random basis)</i>	40
	Total	100
3 rd year- Biochemistry-3	1.Record	10
	2.Paper chromatography/ Thin layer Chromatography/cellulose acetate electrophoresis/ Agar gel electrophoresis. <i>(Any one of the tests may be given to each student on random basis)</i>	50

	3. Estimation of serum bilirubin /estimation of urinary porphyrin/estimation of urinary porphobilinogen/urinary calculi analysis/urea clearance/ creatinine clearance. (Any one of the tests may be given to each student on random basis)	40
	4. Activity determination of serum AST/ ALT/ALP/ ACP/ Amylase/LDH/ CPK/ G ₆ PD/ Ceruloplasmin. (Any one of the tests may be given to each student on random basis)	50
	Total	150
4 th Year- Biochemistry-4	1.Record	10
	2. Function tests based on case study- Acute renal failure/chronic renal failure/nephrotic syndrome/ obstructive jaundice/ haemolytic jaundice/viral hepatitis/ Diabetes mellitus/ Diabetes ketoacidosis/pancreatitis/myocardial infarction/gout. (Any one of the case may be given to each student on random basis)	60
	3. Estimation of hormone metabolites in urine- VMA/ 5-HIAA/ 17- ketosteroids/ 17- ketogenic steroids/ urinary estriol. (Any one of the tests may be given to each student on random basis)	40
	4. Estimation of serum calcium/ serum inorganic phosphorus/ serum iron/ serum copper/ serum magnesium/ serum sodium & potassium. (Any one of the tests may be given to each student on random basis)	40
	Total	150

4 th year project evaluation	Project content, Methods & findings	25
	Presentation	10

79

	Open viva	15
	Total	50

Model of scheme for Pathology Practical examination.

Year& Paper	Exercise	Marks
1st year –Basic Laboratory Sciences and Hematology -1	1.Record	10
	2.Differential count/ RBC Count/ WBC count/PLT count/ AEC/ Reticulocyte count <i>(Any one of the tests may be given to each student on random basis)</i>	40
	3.Hb estimation by Sahli's Hb and Cyanmeth Hb methods/PCV/ESR/ Osmotic fragility /Red cell indices calculation <i>(Any one of the tests may be given to each student on random basis)</i>	30
	4. Spotters(10 spotters)	20
	Total	100
2nd Year- Clinical Pathology and Hematology-II	1.Record	10
	2. Peripheral smear preparation and examination/MPO staining/ SBB staining/ PAS staining/ Perl's stain/ Urine analysis/Semen analysis/CSF analysis <i>(Any one of the tests may be given to each student on random basis)</i>	40
	3. Hb electrophoresis/ Sickling test/ BT/ CT/ PT/ APTT/ Ham's test/ Faces analysis/ pleural fluid, peritoneal, synovial fluid analysis <i>(Any one of the tests may be given to each student on random basis)</i>	30

	4. Spotters(10 spotters)	20
	Total	100
3rd year- Cytology and Transfusion	1.Record	10
	2.Compatibility testing/ABO cell and serum grouping/ Papanicolaou staining/ MGG staining	40

technology	<i>(Any one of the tests may be given to each student on random basis)</i>	
	3. Secretory status in saliva/ Titration of antisera/ Short's stain/ Rh typing by albumin and enzyme addition technique. <i>(Any one of the tests may be given to each student on random basis)</i>	40
	4. DCT/ ICT/ D ^U typing/ Examination of normal and inflammatory smear <i>(Any one of the tests may be given to each student on random basis)</i>	30
	5.Spotters(15 spotters)	30
	Total	150
4th Year- Histo technology and cytogenetic	1.Record	10
	2. Section cutting/ Metaphase spread preparation from bone marrow/ H&E staining <i>(Any one of the case may be given to each student on random basis)</i>	40
	3. PAS staining/ Van Gieson's staining/ Gomori's reticulum/ Perl's Prussian Blue staining/ Barr body demonstration in buckle smear <i>(Any one of the tests may be given to each student on random basis)</i>	40

	4. Honing and stropping/Preparation of Bouin's , Carnoy's and Zenker's fixative/ Demonstration of drum stick appendages. (Any one of the tests may be given to each student on random basis)	30
	5.Spotter(15 spotters)	30

	Total	150
4 th year project evaluation	Project content, Methods & findings	25
	Presentation	10
	Open viva	15
	Total	50

Model of scheme for Microbiology Practical examination.

Year& Paper	Exercise	Marks
1 st year –Basic Microbiology	1.Record	10
	2.Gram staining	25
	3.AFB Staining	20
	4.Motility testing	15
	5.Special staining techniques(capsule, spore, volutin granules, spirochetes),Preparation of articles for sterilization (Any one of the tests may be given to each student on random basis)	10
	Spotters	20
	Total	100
2 nd Year- General Microbiology	1.Record	10
	2.Adjustment of pH of culture medium	10
	3.Media Preparation (Pouring & sterility test)	15
	4.Isolation of mixed culture	15
	5.Spotter	20
	6.Biochemical tests (Any six tests may be given to each student on random basis-6*5)	30

	Total	100
2 nd year – Parasitology & Entomology	1.Record	10
	2.Macroscopic & microscopic examination of stool.	5
	3. Concentration techniques for intestinal parasites in stool.	15

	4. Preparation of Thin and Thick blood smears.	5
	5. Staining , examination & identification of blood parasites.	20
	6. Dissection of mosquitoes to display mouthparts, wings & legs.	20
	7. Collection, Preservation & preparation of permanent mounts of arthropods of public health importance.	25
	Total	100
3 rd year- Bacteriology	1.Record	10
	2.Case study (Samples) (Grams stain, Motility, Biochemical reactions and AST.)	100
	Total	150
4 th Year- Virology, Mycology and Applied microbiology	1. Record	10
	2. Identification fungus	50
	3. ELISA	20
	4. Case study (specimen) for Hospital acquired infn	50
	5. Water analysis	20
	Total	150
4 th year project evaluation	Project content, Methods & findings	25
	Open viva	15
	Total	50

3.7 . Practical Examination: A certified practical Record is compulsory for each subject and that will be evaluated at the time of concerned Practical Examination. A maximum of 10 marks shall be given for the record.

3.8 Details of practical/clinical practical exams

As given under “Details of theory exams “

3.9 Number of examiners needed (Internal & External) and their qualifications

One set of Examiners will be sufficient (one external and one internal) to conduct the practical and viva examination in all the subjects.

There shall be two examiners for practical and viva –one internal and one external. The external examiner shall be drawn from other institutions where a similar course is being conducted. Both internal and external examiners should have MD in the concerned subject or MSc MLT in the concerned subject and those who are full time teachers of Medical Laboratory Technology with at least two years of full time teaching experience in medical laboratory technology after the acquisition of MD or MSc MLT in the concerned subject. The theory papers should also be evaluated by teachers with the above qualifications. The examiner/Evaluator in paper XII should be having MSc MLT with Biochemistry, Microbiology or Pathology specialization.

3.10 Details of viva: division of marks

As given under “Scheme of examination showing maximum and minimum marks”

4. INTERNSHIP

No internship for BSc(MLT) course or otherwise by Govt. order

5. ANNEXURES

5.1 Check Lists for Monitoring: Log Book, Seminar Assessment etc. to be formulated by the curriculum committee of the concerned Institution

SYLLABUS

**for Courses affiliated to the
Kerala University of Health Sciences**

Thrissur 680596



**BACHELOR OF SCIENCE IN
OPTOMETRY**

Course Code: 013

(2016-17 Academic year onwards)

2016

2. Course Content

2.1 Title of course:

The name of the course shall be “Bachelor of Science in Optometry” – B.Sc. (OPT)

2.2 Objectives of course

The Course aims at carving out graduates in Optometry who will be well versed in

- Helping the Ophthalmologist in his practice
- Do refraction, contact lens fitting and orthoptic assessment independently
- Involve and do special investigative procedures
- To operate and maintain Ophthalmic instruments
- To maintain Ophthalmic theatre and Operating Instruments
- To run and establish an Optical shop

2.3 Medium of instruction:

Medium of instruction shall be English

2.4 Course outline

The course shall comprise of the theoretical and practical studies in different branches of Optometry and its related subjects.

In addition to practical training in the Department of Optometry, the students will be posted to the departments of Anatomy, Physiology, Physics, Microbiology and Optical workshop attached to Ophthalmic clinics. Besides practical classes, the training in Optical work should be given in clinics, with the candidate taking active part in the routine work of the out-patient department.

BASIC SCIENCE COURSE

1. English
2. Physics
3. Basics in applied Chemistry
4. Mathematics
5. General Anatomy
6. Ocular Anatomy
7. General Physiology
8. Ocular Physiology
9. Information Technology
10. Nutrition & Biochemistry
11. Microbiology
12. Pathology
13. Pharmacology

CORE COURSES

1. Optometric Optics
2. Clinical Examination of Visual Systems & Instruments
3. Visual Optics
4. Systemic Diseases Medicine
5. Eye Diseases
6. Contact Lens
7. Low Vision aid and Dispensing Optics & Mechanical Optics
8. Binocular Vision & Squint
9. Community Optometry
10. Project

2.5 Duration

The duration of the course shall be 3 (three) year + one year compulsory rotating internship which follows semester system with examinations at the end of each year. Approximately 240 working days in a year with a minimum of 6 hours per day which works approximately 1450 working hours per year. After the 3rd year, they have to do a compulsory rotating internship in various specialty departments for one year.

2.6 Subjects

As given under “Teaching learning methods “and “Content of each subject in each year”

2.7 Total number of hours

Approximately 240 working days in a year with a minimum of 6 hours per day which works approximately 1450 working hours per year.

2.8 Branches if any with definition :

Not applicable

2.9 Teaching learning methods:

BASIC SCIENCE COURSES

First Year

1. ENGLISH

I Grammar

Aim: The study of grammar of functions, language skills and fluency. One ought to know the basic rules of the English language to use it effectively. Acquire a good knowledge of English – its grammatical rules.

Topics for study

1. Verbs
2. The system of Tenses in English (Present, Past and Future – Tenses)
3. Voice – Active and Passive
4. Use of Articles
5. Prepositions

6. Question Tags

7. Correction of Sentences

(Teaching Hours – 25)

II The Sounds of English: To introduce the students to the sound sense of the English language. For effective speech, the basic understanding of the sound system of English is essential.

1. Twenty distinct vowels. (Vowels & diphthongs)

2. Twenty four different consonants.

All 44 phonetic symbols to be taught. The students should be able to transcribe monosyllabic words in International Phonetic Alphabet (IPA).

3. Word Accent – Importance of stress in English (only Primary stress for study)

4. Intonation - Rising and falling

(This part is only to introduce to the students that each language has a different language system. In foreign language learning one tends to hear and speak on the basis of the system of one's own language. Therefore, one has to resist the pull of the mother tongue influence and adequately listen and learn the foreign language. (Teaching Hours – 10)

III Students should be able to use the English language to meet the requirements of day to day real life and academic activities. Hence a certain level of fluency of the system language is essential. This is to help the student use English effectively in a debate, discussion, job interview etc.

1. To speak on personal experiences, opinion and attitudes etc. Personal topics – like

Your idea of friendship or What is your outlook in life?

2. Students often have to participate in group discussions and express themselves on topics of general interest.

General topics – like – Tourism – Globalization – Medical ethics

(This is mainly a speaking skill, and interactive class room work is

required) For the examination this will be a written test wherein the students has to express himself in five clear sentences on any topic that is asked. (Teaching Hours – 10)

IV Language is used to perform communicative functions. Functions in English are a very important part of learning to speak the language : Hence dialogue is an important aspect of language learning.

1. Greeting – make a request – apologies or congratulate – ask for directions, etc.

2. Dialogue Writing – Simple situational conversation on everyday situations.

(Interactive class room work is required)

(Teaching Hours – 10)

V The study of English language in this course should make the student aware that it enhances the subject of his study.

Introduce the students to Medical Terms.

1. Terms in Ophthalmology
2. Make the students write short reports – medical reports that an Optometrist would be required to write. (Teaching Hours – 5)

VI Reading skill is very important. A student should be able to read at a speed of atleast 100 words per minute. Reading should focus on better comprehension. Comprehension is to grasp an idea or concept in its entirety.

Aim : 1.To help the student read faster with better comprehension

2. Grasp the meaning from the contexts
3. Express what one has understood in appropriate words. Students ought to be trained to acquire study reading speed. Study reading speed aimed at total comprehension and retention of meaning.

(Teaching Hours – 20)

TOTAL TEACHING HOURS : 80

Books Prescribed for study :

1. Functional Grammar and Spoken and Written Communication in English Bikram K. Das, Published by Orient Longman.
2. A course in Listening and Speaking I (with CD)
- V. Sasikumar, P.Kiranmai Dutt, Geetha Rajeevan – Published by Foundation Books

2. PHYSICAL AND GEOMETRICAL OPTICS

GEOMETRICAL OPTICS I

No.	Topics	No of hrs.
1	Nature of light – light as electromagnetic oscillation; ideas of sinusoidal oscillations; amplitude and phase; speed of light in vacuum and other media; refractive index.	2
2	Wavefronts – spherical, elliptical and plane; Curvature and vergence; rays; convergence and divergence in terms of rays and vergence; vergence at a distance	2
3	Refractive index; its dependence on wavelength	1
4	Fermat's and Huygen's Principle – Derivation of laws of reflection and refraction (Snell's law) from these principles	4
5	Plane mirrors – height of the mirror; rotation of the mirror	1

6	Reflection by a spherical mirror – paraxial approximation; sign convention; derivation of vergence equation	1
7	Imaging by concave mirror	2
8	Imaging by convex mirror	2
9	Reflectivity; transmittivity	1
10	Snell's Law; refraction at a plane surface	1
11	Glass slab; displacement without deviation; displacement without dispersion	2
12	Thick prisms; angle of prism; deviation produced by a prism; refractive index of the prism	2
13	Prisms; angular dispersion; dispersive power; Abbe's number.	2
14	Definition of crown and flint glasses; materials of high refractive index	1
15	Thin prism – definition; definition of Prism diopter; deviation produced by a thin prism; its dependence on refractive index	2
16	Refraction by a spherical surface; <i>sign convention</i> ; introduction to spherical aberration using image formed by a spherical surface of a distance object; <i>sag formula</i>	3
17	Paraxial approximation; derivation of vergence equation	1
18	Imaging by a positive powered surface	2
20	Imaging by a negative powered surface	2
21	Vergence at a distance formula; effectivity of a refracting surface	1
22	Definition of a lens as a combination of two surfaces; different types of lens shapes.	1
23	Image formation by a lens by application of vergence at a distance formula; definitions of front and back vertex powers; equivalent power; first and second principal planes/points; primary and secondary focal planes/points; primary and secondary focal lengths	4
24	Newton's formula; linear magnification; angular magnification	2
25	Nodal Planes	1
26	Thin lens as a special case of thick lens; review of sign convention	1
27	Imaging by a thin convex lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions	2

28	Imaging by a thin concave lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions	2
29	Prentice's Rule	1
30	System of two thin lenses; review of front and back vertex powers and equivalent power, review of six cardinal points.	2
31	System of more than two thin lenses; calculation of equivalent power using magnification formula	2
	Total number of Lectures	49

Text book:

- Tunnacliffe A. H, Hirst J. G, *Optics*, The association of British Dispensing Opticians, London, U.K., 1990.
- Pedrotti L. S, Pedrotti Sr. F. L, *Optics and Vision*, Prentice Hall, New Jersey, USA, 1998.

Reference Books:

- Loshin D. S. *The Geometric Optics Workbook*, Butterworth-Heinemann, Boston, USA, 1991.
- Schwartz S. H. *Geometrical and Visual Optics: A Clinical Introduction*, McGraw-Hill, New York, USA, 2002.
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GEOMETRICAL OPTICS II

1	Cylindrical Lenses; image formation; relation between cylinder axis and line image orientation	2
2	Imaging due to two cylinders in contact with axes parallel	1
3	Two cylinders in contact with axes perpendicular; line images and their orientations to the cylinders' powers; interval of Sturm; circle of least confusion (CLC); spherical equivalent; position of CLC	6
4	Spherical lens and a cylindrical lens in contact; spherical equivalent; interval of Sturm and CLC	2
5	Spherocylindrical lens notations – plus/minus cylinder form, cross cylinder/meridian form; transformations between them	3
6	Field stops and apertures; entrance and exit pupils	1
7	Apertures and defocus blur	1
8	Receiver/detector diameter; depth of focus; depth of field	1
9	Chromatic Aberrations; methods of removing chromatic aberrations; Abbe number	2

10	Monochromatic Aberrations – deviation from paraxial approximation; difference between ray aberrations and wavefront aberrations	2
11	Third order aberrations – spherical aberrations; coma; astigmatism; distortion and curvature of fields	2
12	Ways of minimizing spherical aberrations – pupil size, bending of lens, shape factor	2
13	Lens tilt – astigmatism	1
14	Higher order aberrations; introduction to Zernike Polynomials	1
15	Telescopes – Keplerian, Galilean and Newtonian; position of cardinal points, entrance and exit pupils; magnifications; advantages and disadvantages	4
16	Microscopes – magnification; tube length.	2
17	Gullstrand's Schematic Eye (GSE); calculation of the power of the cornea, the lens and the eye; axial length; calculation of the position of the cardinal points; magnification	2
18	GSE - Purkinje images and their reflectances	1
19	GSE - entrance and exit pupils for a 3mm pupil; ocular aberrations – spherical aberrations and coma; chromatic aberrations.	2
20	GSE – introduction to refractive errors - myopia and hyperopia; corneal curvature; axial length; far point; blur size calculations; corrections; astigmatism; blur size; circle of least confusion; correction.	4
21	GSE - Object closer than at infinity; introduction to accommodation; far point; near point; presbyopia; spectacle and contact Lens corrections - comparison of magnification	3
	Total number of Lectures	45

Text book:

- Tunnacliffe A. H, Hirst J. G, *Optics*, The association of British Dispensing Opticians, London, U.K., 1990.
- Pedrotti L. S, Pedrotti Sr. F. L, *Optics and Vision*, Prentice Hall, New Jersey, USA, 1998.

Reference Books:

- Loshin D. S. *The Geometric Optics Workbook*, Butterworth-Heinemann, Boston, USA, 1991.
- Schwartz S. H. *Geometrical and Visual Optics: A Clinical Introduction*, McGraw-Hill, New York, USA, 2002.

PHYSICAL OPTICS

No.	Topics	No of hrs.
1	Nature of light – light as electromagnetic oscillation – wave equation; ideas of sinusoidal oscillations – simple harmonic oscillation; transverse nature of oscillation; concepts of frequency, wavelength, amplitude and phase.	7
2	Sources of light; Electromagnetic Spectrum.	1
3	Polarized light; linearly polarized light; and circularly polarized light.	1
4	Intensity of polarized light; Malus' Law; polarizers and analyzers; Methods of producing polarized light; Brewster's angle.	2
5	Birefringence; ordinary and extraordinary rays.	2
6	Relationship between amplitude and intensity.	1
7	Coherence; interference; constructive interference, destructive interference; fringes; fringe width.	2
8	Double slits, multiple slits, gratings.	2
9	Diffraction; diffraction by a circular aperture; Airy's disc	2
10	Resolution of an instrument (telescope, for example); Raleigh's criterion	2
11	Scattering; Raleigh's scattering; Tyndall effect.	2
12	Fluorescence and Phosphorescence	1
13	Basics of Lasers – coherence; population inversion; spontaneous emission; Einstein's theory of lasers.	5
14	Radiometry; solid angle; radiometric units; photopic and scotopic luminous efficiency and efficacy curves; photometric units	4
15	Inverse square law of photometry; Lambert's law.	2
16	Other units of light measurement; retinal illumination; Trolands	1
	Total number of Lectures	37

Text Book: Subrahmanyam N, Brij Lal, *A text book of Optics*, S. Chand Co Ltd, New Delhi, India, 2003.

Reference Books:

Pedrotti L. S, Pedrotti Sr. F. L, *Optics and Vision*, Prentice Hall, New Jersey, USA, 1998.
Keating NM. P,

Practical: (20 hours)

Each practical session could be evaluated for 10 marks and the total could be added to the final evaluations. These practical's could be customized as per the university requirements and spaced apart conveniently. The practical's to be done include the following:

- Thick Prism – determination of prism angle and dispersive power; calculation of the refractive index
- Thin Prism – measurement of deviation; calculation of the prism diopter
- Image formation by spherical mirrors
- Convex lens - power determination using lens gauge, power determination using distant object method; power determination using the vergence formula
- Concave lens – in combination with a convex lens – power determination.
- Construction of a tabletop telescope – all three types of telescopes.
- Construction of a tabletop microscope
- Imaging by a cylindrical lens – relationship between cylinder axis and image orientation
- Imaging by two cylinders in contact – determination of the position of CLC; verification of CLC using a spherical lens with power equal to the spherical equivalent; orientations and position of the line images and their relation to the cylinders' powers and orientations
- Imaging by a spherocylindrical lens – sphere and cylinder in contact – determination of the position of CLC; verification of CLC using a spherical lens with power equal to the spherical equivalent; orientations and position of the line images and their relation to the cylinder's power and orientation

3. BASICS IN APPLIED CHEMISTRY

Total Hours – 40

General and Organic Chemistry (Theory)

1. Bonding in hydrocarbons and introduction to reaction mechanism:
Hybridisation involving s and p orbitals, geometry of methane, ethane, ethene, ethyne and benzene
Electron displacement in a covalent bond, inductive effect, electromeric effect, resonance and hyperconjugation. Fission of a covalent bond, free radicals, Carbocations, Carbanions, Electrophiles and Nucleophiles. Substitution, addition, elimination and rearrangement reactions – illustration with examples.
2. Stereoisomerism:
Causes of optical activity, optically active compounds (lactic and tartaric acid), enantiomers, diastereoisomers, racemisation, resolution.
Geometrical isomerism (maleic and fumaric acids). Keto – enol tautomerism.
3. Aromatic Compounds:

Benzene : isolation and uses. Properties of benzene : alkylation, acylation, nitration, halogenation and sulphonation.

4. Carbohydrates:

Mono – di – and poly saccharides, examples. Preparation and reactions of glucose, fructose and sucrose.

Sources of starch and cellulose, their uses.

5. Chemotherapy:

Preparation and uses of sulpha drugs. Structure and uses of penicillin and chloromycetin.

Vitamins and Hormones : Structure and biological activities of Vitamin A, B1, B12, and C (Elucidation of structure not included). Classification and functions of hormones.

6. Colloids, Chromatography and buffers:

Emulsions : Preparation, properties and applications.

Principle of column, paper and thin layer chromatography – applications. Buffer action, pH of buffer in living systems, determination of pH by colourimetric and electrometric methods.

4. MATHEMATICS

Total hours - 40

- Trigonometry (10 hours)

Trigonometric Functions of sum and difference. Trigonometric Functions of multiples and submultiples. Inverse Trigonometric functions. Review of complex numbers – Evaluation of roots of complex numbers – nth roots of unity – properties – Expansion of multiples and powers of trigonometric functions.

- Calculus (15 hours)

Differentiation of algebraic and Trigonometric functions – Function of a Function – simple problems. Successive differentiation. Radius of curvature. Integration of algebraic and trigonometric functions – Integration by substitution and by parts – Definite Integrals. Fourier series – Laplace transformations.

- Algebra (15 hours)

Logarithms, common and Napierian, Partial Fractions – statements of Binomial Exponential and Logarithmic theorems – Use of these in summation and Approximations – Roots of an Equation – Relations connecting roots and Coefficients.

Basic biostatistics will be taught in order to enable the students to complete project work

- Statistics graphs & Diagrams
- Measurement of central tendency, dispersion & correlation
- Tests of hypothesis (z-test, t-test, Chi-square)

Reference Books:

1. Trigonometry by Dr. R.S. Varma and Dr. K.S. Shukla
2. Trigonometry by S.Lonery
3. Differential calculus by Santhi Narayan
4. Calculus by Manica Vachakom Pillai and Natarajan
5. Algebra by Manica Vachakom Pillai
6. NCERT Mathematics Textbooks for class XI and class XII
- 7.

5. ANATOMY

I. General Anatomy

- | | |
|------------------------------------|-----------|
| a. Terms and subdivisions | - 1 hr. |
| b. Epithelium and glandular tissue | - 3 hrs. |
| c. Connective tissue | - 2 hrs. |
| d. Cartilage | - 1 hr. |
| e. Bone and joints | - 3 hrs. |
| f. Lymphatic tissue | - 2 hrs. |
| g. Nervous tissue | - 1 hr. |
| h. Vascular tissue | - 1 hr. |
| i. Muscular tissue | - 1 hr. |
| j. Skin and appendages | - 1 hr. |
| k. Slide demonstration | - 11 hrs. |

TOTAL HOURS : 30 Hours

II. Systemic Anatomy

- | | |
|----------------|----------|
| a. CVS | - 3 hrs. |
| b. Respiratory | - 3 hrs. |
| c. GIT | - 5 hrs. |
| d. Lymphatic | - 2 hrs. |
| e. Endocrine | - 2 hrs. |
| f. CNS | - 3 hrs. |

- g. ANS - 2 hrs.
 h. Musculoskeletal - 5 hrs.
 Demonstration - 10 hrs.
TOTAL HOURS : 25 + 10 - 35 hrs.

Books Prescribed for study

Text Book:

- a) BD Chaurasia: Handbook of general Anatomy, Third edition, CBS Publishers, New Delhi, 1996
 b) GJ Tortora, B D logy,11th edition, John Wiley & Sc

6. OCULAR ANATOMY

No.	Topics	No of hrs
1	Cornea: Anatomy of all the layers, cellular structure, nerve supply, reason for transparency, refractive properties	2
2	Coats of eyeball: 1. Sclera (episclera & sclera) 2. Choroid (Iris, ciliary body, choroid) 3. Retina Detailed anatomy, cellular structure, vasculature, nerve supply for all the above coats, pupils, nerve supply for pupillary actions, pupillary pathway.	6
3	Crystalline lens	2
4	Aqueous, anterior chamber, vitreous body	3
5	Ocular Embryology	2
6	Detailed study of orbit	2
7	Ocular Adnexa and Lacrimal system	2
8	Extra ocular muscles (anatomy, innervations, action)	2
9	Orbital Blood supply	2

10	CRANIAL NERVES: Detailed study of each of the following nerves in terms of their nuclei, course, relationship within brain, effects of compression etc at different regions 1. Optic nerve 2. Oculomotor nerve 3. Trochlear nerve 4. Trigeminal nerve 5. Abducent nerve 6. Facial nerve	10
11	Visual Pathway	3
12	Autonomic Innervations of Ocular structures	3
	Total Number of Hours	39

Reference Books:

- AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006
- L A Remington: Clinical Anatomy of the Visual System, Second edition, Elsevier Butterworth Heinemann, Missouri, USA, 2005.

7. PHYSIOLOGY

Total Number of Hours : 100 Hours
Theory : 90 Hours
Practicals : 10 Hours

Details

I. HAEMATOLOGY 12 hrs.

Introduction, Composition & function of blood,
specific gravity, Viscosity Plasmaproteins 1 hr.

Red Blood Cells

Structure, Normal count, Variations, Properties Haemoglobin
– normal value, Variations, Structure Abnormal Hbs,

Erythropoiesis, Factors affecting – Anemia – classification, details of various types of Anemia. 4 hrs.

White Blood Cells

Morphology, Normal total count, differential count, Variations, Properties and Functions, Leucopoiesis, Factors affecting. 2 hrs.

Platelets

Morphology, Normal count, Variations, Functions of Platelets, Hemostasis – Details, Thrombopoiesis 1 hr.

Coagulation of Blood

Clotting factors, Intrinsic & Extrinsic mechanisms, Defects in Coagulation, Bleeding time, Clotting time, Anticlotting mechanisms in the body, Anticoagulants 2 hrs.

Blood Groups

ABO system, Landsteiner’s laws, Importance of cross matching, Blood transfusion, complications of mismatched blood transfusion, Rh system, Rh incompatibility 1 hr.

Blood Volume

Normal Value, Variations, one method for estimating blood volume, Lymph, Composition, Functions & Formation of Lymph. Starling’s hypothesis of tissue Fluid formation, Edema 1 hr.

II. CARDIO VASCULAR PHYSIOLOGY 10 hrs.

Functional anatomy, conducting system of heart origin & conduction of Impulses 1 hr.

Cardiac cycle, Various phases, heart sounds ECG 2 hrs.

Cardiac Output

Definition normal values variations, Regulation of stroke volume – Homometric – heterometric, One method to meas Cardiac output	2 hrs.
Heart Rate	
Normal value, Variations, regulation of heart rate	1 hr.
Arterial Pulse	
Blood Pressure	
Definition, Normal, Value variations, Determinations of Blood pressure, Estimation of Blood pressure, Regulation of Blood pressure, Shock, Compensatory mechanisms in shock	3 hrs.
Regional Circulation	
Coronary Circulation, Pulmonary Circulation, Cutaneous circulation, Cerebral circulation	1 hr.
III. RESPIRATORY SYSTEM	8 hrs
Introduction, Functional anatomy, Respiratory muscles and their actions During Ventilation	1 hr.
Intrapleural pressure, Intrapulmonary pressure, Pressure changes during Respiratory cycle,	
Lung volumes & Capacities	1 hr.
Respiratory dead space, Pulmonary circulation,	
Gas exchange across the Respiratory membrane, Factors affecting diffusion	1 hr.
O ₂ transport through blood, Oxygen dissociation Curve,	
Factors shifting the ODC to right & left	1 hr.
Carbondioxide transport	1 hr.

Regulation of respiration, a) Neural, b) Chemical, Abnormalities in regulation, Hypoxia, Hypercapnoea Cyanosis, Asphyxia	2 hrs.
Changes in Barometric pressure in respiration, Exercise Physiology, Artificial Respiration	1 hr.
IV. GASTROINTESTINAL SYSTEM	8 hrs.
Functional anatomy, Enteric nervous system, Salivary secretion, Innervation of Salivary glands, Composition & functions of Saliva, Regulation of secretion	2 hrs.
Gastric secretion	
Gastic glands, Composition & functions of pancreatic juice. Regulation, Hydrochloric acid secretion, factors affecting, Peptic ulcer	1 hr.
Pancreatic secretion	
Functional anatomy, composition & functions of pancreatic juice. Regulation of pancreatic secretion	1 hr.
Liver	
Functional anatomy, composition & functions of Bile regulation of secretion. Bile salts, Bile pigments, Enterophepatic circulation, Jaundice, Functions of gall Bladder	1 hr.
Movements of GIT	
Mastication, Deglutition – stages, Gastric movements, Small intestinal movements, small intestinal movements, Abnormalities	2 hrs.
Movements of large intestine Defecation reflex, Abnormalities	1 hr.

	Digestion & absorption of Carbohydrates, Proteins & fat	1 hr.
V.	RENAL PHYSIOLOGY	5 hrs.
	Functional anatomy – Nephron, Renal blood flow, Glomerular filtration, Factors affecting GFR	1 hr.
	Tubular function	1 hr.
	Concentration of Urine	1 hr.
	Acidification of Urine	1 hr.
	Urinary Bladder	
	Innervation, Mictarition reflex, Cystometrogram, Abnormalities	1 hr.
VI.	PHYSIOLOGY OF CENTRAL NERVOUS SYSTEM	15 hrs.
	Sensory System	
	Organisation of nervous system, Functional anatomy, Synapse, Synaptic Transmission, Synaptic inhibition, Properties of Synapse	1 hr.
	Reflex action – components, Properties, Mono synaptic & Poly synaptic Reflexes, Stretch reflex, Inverse stretch reflex, Receptors – types of Receptors, Receptors potential	1 hr.
	Pathways of sensations from body & face	2 hrs.
	Pain – referred pain, control of pain	1 hr.
	Thalamus	
	Functional anatomy, connections & functions, Thalamic Syndrome	1 hr.
	Motor System	
	Functional anatomy, Pyramidal tract, Lesions, Differences between upper Motor & Lower motor neuron lesions	2 hrs.
	Basal Ganglia	
	Functional anatomy, connections & functions, Parkinsonism	1 hr.

Cerebellum

Gross structure, Histology, connections & functions,

Cerebellar lesion 1 hr.

Limbic System

Connections & Functions 1 hr.

Reticular formation – connections functions, Ascending

Reticular Activating System 1 hr.

Vertibular apparatus

Functional anatomy receptors, Connections & Functions 1 hr.

Cerebral Cortex

Brodmanns areas, functions,

Higher functions – Speech

Learning

Sleep & EEG Memory

Hypothalamus - Connections & Functions, Postural reflexes 1 hr.

VII. SPECIAL SENSES 14 hrs.

Olfaction

Olfactory mucosa, Olfactory receptors, Olfactory pathway 1 hr.

Taste

Receptors – Primary sensations of taste, Gustatory pathway 1 hr.

Audition

Functional anatomy, functions of middle ear, structure of

Cochlea, Auditory Pathway, Deafness, Endocochleor potentials 2 hrs.

Vision

Functional anatomy of the eye, Optical systems of the eye,

Physiology of Optics 1 hr.

Near response, Accommodation 1 hr.

Refractive errors, Visual Acuity, Measurement of visual acuity, Field of Vision, Measurement 1 hr.

Visual Sensation

Receptors – Structure, Photochemistry of vision, Role of Vitamin A in Vision, Sensitivity of Retina to various degree of Illumination. Dark and Light adaptations, Electrophysiology of vision 2 hrs.

Pathways for vision, Pathways for pupillary Reflexes, Pathways for accommodation 1 ½ hrs.

Cortical representations, Lesions of Optic Pathways 1 hr.

Colour Vision – Latest View, Colour blindness, Tests for colour vision 1 ½ hrs.

VIII. ENDOCRINOLOGY 10 hrs.

Endocrine glands in human body. Hormone – definition, Second messengers, Radiomunossay of hormones, Anterior pituitary gland, Hormones secreted 1 hr.

Growth hormone, actions, conditions in which the hormone secretion is affected, regulation. Other hormones secreted, target organs 1 hr.

Posterior Pituitary - Hormones, Actions

Neuroendocrine Reflexes 1 hr.

Thyroid Gland - Hormones secreted

synthesis, actions, Regulation of secretion clinical abnormalities 2 hrs.

Hormones regulating blood calcium level, Para Hormone,

Calatonin, 1-25 di OH Chole calciferol 1 hr.

Adrenal Cortex

Hormones, Biosynthesis, Actions, Regulations,
Clinical abnormalities 1 hr.

Adrenal Medulla

Hormones, Biosynthesis, Actions, Clinical abnormalities 1 hr.

Endocrine Pancreas

Histology, Hormones – Insulin, Glucagon, Actions,
regulation of secretion, Clinical abnormalities 1 hr.

Pineal Gland – Local hormones 1 hr.

IX. TEMPERATURE REGULATION, CSF, ANS etc. 2 hrs.

Practicals : Total 10 hrs.

Demonstrations Only

1. The Compound Microscope
2. Microscopic Examination of blood
3. Erythrocyte Sedimentation Rate
4. Packed Cell Volume
5. Osmotic Fragility
6. Estimation of Haemoglobin
7. Enumeration of Red Blood Cells
8. Enumeration of White Blood Cells
9. Differential Count
10. Determination of Blood Group
11. Determination of Bleeding Time & Clotting Time
12. Measurement of Arterial Blood Pressure in man
13. Perimetry

Reference Book:

- AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006
- A C Guyton: Text book of Medical Physiology, 6th edition, saunders company, Japan, 1981
- G J Tortora, B Derrickson: Principles of anatomy & physiology, 11th edition,
- John Wiley & Sons Inc, New Jersey, 2007

8.Ocular Physioly

No.	Topics	No of hrs
1.	Protective mechanisms in the eye	1
2.	Precorneal tear film, eyelids and lacrimation	2
3.	Extrinsic Ocular muscles, their actions and control of their movements	2
4.	Saccadic, smooth pursuit and Nystagmic eye movements	2
5.	Corneal Physiology	4
6.	Aqueous humor and vitreous: Intra ocular pressure	3
7.	Iris and pupil	3
8.	Crystalline lens and accommodation – presbyopia	2
9.	Retina – structure and functions, dark and Light Adaptations	4
10.	Vision – general aspects of sensation	2
11.	Pigments of the eye and photochemistry, electrophysiology	4
12.	The visual stimulus, refractive errors	3
13.	Visual acuity, vernier acuity and principle of measurement	2
14.	Visual perception – Binocular vision, stereoscopic vision, optical illusions	4
15.	Visual pathway, central and cerebral connections, lesions of pathway and effects	4
16.	Colour vision and colour defects. Theories and diagnostic tests	3
	Total number of Hours	45

Reference Book:

- RD Ravindran: Physiology of the eye, Arvind eye hospitals, Pondicherry, 2001
- PL Kaufman, A Alm: Adler's Physiology of the eye clinical application, 10th edition, Mosby, 2002
- AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006

SECOND YEAR

6. INFORMATION TECHNOLOGY

Total hours-20

Module 1:

Functional Introduction to IT – Personal Computers – Functional Parts – CPU, Input and Output Devices – RAM and ROM – Software & Hardware – PC specifications – Networking of computers (General Information Only) – Internet– Services over the Internet – E-mail, www, FTP, etc, Search Engines, Programming Languages – Concepts of low level and High level Languages. Types of Computers – PC, Laptops, Palmtops etc.

Module 2:

Operating systems – Definition – Functions of Operating Systems – Examples of EUI based operating systems – windows and linux. Basic operating system commands – creating and managing files and folders – managing desktop – basic utilities – viruses and antiviruses.

Module 3:

Application softwares – Office packages (Microsoft Office/Open Office) – Word processing – spread sheets, presentation softwares – Data Bases – Generic features only – Popular Browsers (Generic features only) – Image Processing packages – general features only.

Text Books

1. D'souza & D'souza, Learn computers step by step, Person Education
2. Leon, Introduction to IT, Leon Tech Publishers.

References

1. Peter Nroton, "Introduction to computers", Tata Mc Graw Hill
2. Swarup K.Das, "A text book of Information Technology". Dominant Publishers, New Delhi.

11. NUTRITION & BIOCHEMISTRY

General Biochemistry, Ocular Biochemistry & Nutrition

Total Hours	-	70
Theory	-	60
Practicals	-	10

THEORY

- I. Introduction - 1Hour
- II. Carbohydrates - 12 hours
Chemistry
Glycolysis, HMP shunt pathway; Galctose & Fructose metabolism, Glycogen metabolism; Glycogen storage diseases, TCA cycle, Glycosaminoglycans, Blood sugar and its regulation, GTT; Diabetes mellitus
- III. Proteins - 10 hours
Chemistry Functions, Essential Amino acids, Plasma Proteins, Immunoglobulins, Complete and Incomplete Proteins; Supplementary food, PEM and Eye; Quality of proteins, Nitrogen Balance, Urea cycle, Metabolism of amino acids – Sulphur containing amino acids & Tyr.
- IV. Lipids – 7 hours
Classification, Essential fatty acids, Beta oxidation, Fatty acid synthesis, Ketosis, Excess and deficiency – Lipids & Eye, Hyperlipidemias – diseases – Atherosclerosis, Lipoproteins; Prostaglandins.
- V. Enzymes – 3hours
Classification – Factors affecting enzyme action – Enzyme inhibition, Clinically important enzymes.
- VI. Nutrition – 4 hours
 - Energy metabolism – units of energy, Energy value of food, Malnutrition, Balanced diet, Calorie requirement at different age groups, RDA; Alternative food pattern.

- Introduction to Nutrition, food group and food pyramids.
- Assessment of Nutritional status.
- Role of nutrition in ocular aging.

VII. Vitamins – 7hours

Vitamin A, Its role in vision & Regulatory mechanisms of Ophthalmologically important vitamins, Vitamin D & K, Vitamin E, Free radicals and antioxidants, B complex vitamins, Vitamin C.

VIII. Minerals – 3 hours

Macrominerals (1 hr), Microminerals (2 hrs), Fe, Cu, Se, Zn, I

IX. Hemoglobin

Heme – synthesis & catabolism (Mention only), Disorders of synthesis – Prophyrias, Jaundice.

X. Protein Synthesis and mutation (Mention Only) – 1 hour

XI. Buffers, pH of blood, Acid base balance – 1 hour

XII. Miscellaneous – 3 hours

Low Birth Weight, Dietary toxins, Alcohol metabolism; Methanol poisoning, Measles and associated eye disorders, Green leafy vegetables, Dietary fibre.

XIII. Ocular Biochemistry – 6 hours

1. Importance of ocular biochemistry in ophthalmic practice
2. Tear film – composition –lipid layer – aqueous layer – mucoid layer – functions dysfunctions – tear substitutes.
3. Cornea – biochemical composition – corneal metabolism – nutrient uptake – transparency – irrigating solutions – aging – recent developments.
4. Lens – composition – metabolism – transparency – cataract formation , sugar cataracts and medical therapy – recent developments.
5. Aqueous humor – IOP and glaucoma
6. Vitreous humor – intraocular gels.
7. Retina – structure – composition – photoreceptor cell – metabolism and functions – phagocytosis – Retinal neurochemistry – Monoamines – acetylcholine – GABA – amino acids – taurine – neuropeptides – Biochemical correlates of retinal diseases.

PRACTICALS

1. Abnormal constituents of urine – 4 hrs
2. Estimation of sugar and protein (demonstration) – 2 hrs
3. Electrophoresis & Chromatography (demonstration) – 2 hrs
4. Preparation of Phosphate buffer, phosphate buffered saline – 2 hrs

Reference book

1. Review of biochemistry (Harper)
2. Textbook of Biochemistry (Dr.M.Vasudevan & Dr.Sreekumari)
3. Textbook of Biochemistry (Thomas.M. Delvin)
4. Human nutrition & Dietetics (Gallon, James, Ralph 10th editing)

11. MICROBIOLOGY

At the end of the course, the student should:-

- a) Acquire knowledge of the different organisms that infect the human eye.
- b) Acquire the skill to use the basic methods of sterilization and disinfection in his day work and interpret Microbiology culture reports from the laboratory.
- c) Be motivated to use the acquired knowledge and skill to prevent microbial diseases of the eye, connected with optometric used in the eye.

Syllabus with Schedule of teaching

Lectures	-	55 hrs
Demonstration	-	5 hrs
Total	-	60 hrs

1. Introduction and General Microbiology – 10 hrs To include:

Morphology and physiology of Bacteria, Culture media and methods in identification of bacteria, antibiotic sensitivity testing and rational of use, sterilization and disinfection – Basic principles and application in optometry, infection and epidemiology of infectious diseases.

2. Immunology – 5 hrs To Include :

Antigen, antibody, Structure and function of immune system, routine serological tests, Hypersensitivity, autoimmune diseases affecting the eye

3. Systematic Bacteriology – 15 hrs To Include :

All gram – positive cocci and gram- negative cocci, gram-positive bacilli – Corynebacterium diphtheriae, Clostridia, Bacillus, Actinomyces and Nocardia, gram-negative bacilli – Enterobacteriaceae, Pseudomonas, Hemophilus, Mycobacteria,

4. Virology – 10 hrs.

To include : Introduction with morphology and microscopy, modes of transmission and cultivation, Herpes, Pox, Adeno, Papova, Paramyxo, Picorna, HIV, Hepatitis, Applied Virology.

5. Mycology – 4 hrs.

To include : Fungi that infect skin and superficial tissues, subcutaneous mycoses, opportunistic mycoses, antifungals used in the eye.

6. Parasitology & Entomology – 6 hrs.

To include : Introduction and modes of spread, amebae with special reference to free living amoebae, toxoplasmosis, filariasis and ocular filariasis, scabies, head and body lice.

7. Applied Microbiology – 5 hrs.

To include : Specimen collection from eye and adnexa, lab diagnosis of common bacterial and viral infections of the eye, Lab diagnosis of fungal and parasitic diseases of the eye.

Demonstration

Morphology and culture media, Instruments used in sterilization and their working, Use of common disinfectants and waste disposal, Lab diagnosis of eye infections – Using isolates from the hospital lab.

Laboratory Facilities:

Microscopes – 4

for demonstration

Culture media and instruments used for sterilization/disinfections may be borrowed from the hospital lab or demonstration may be conducted in the hospital by arranging visit to sterile department and wards.

Prescribed Books:

1. Greenwood. D, Slack RCB, Peuthere JF, Medical Microbiology 15th Edition 2000; Churchill Livingstone ELBS Edition.

Reference Books:

2. Immunology (National Medical Series: Hyde RM. B.I. Waverly Pvt. Ltd.
3. Textbook of Parasitology. C.K. Jayaram Panicker, 4th Edition.

12. PATHOLOGY

a) AIM

Aim of teaching Pathology for B.Sc. Optometry students is to provide the students with a comprehensive knowledge of the mechanism and cause of disease process, in order to enable him/her to achieve an understanding of the natural history and clinical manifestation of the disease.

1. OBJECTIVE

a) Knowledge

At the end of the course, the student shall be able to

- i. Describe the mechanism of cell death, the degeneration, cellular adaptation, patterns of tissue response to cellular injury and repair and be able to correlate structural and functional alternations.
- ii. Explain the Pathophysiological processes which govern the maintenance the Homeostasis, Mechanism of their disturbance and morphological and clinical Manifestations associated with
- iii. Describe the aetopathogenesis and morphological changes of common infections and neoplastic processes.
- iv. Describe the pathological findings on common ocular diseases.

b) Skill

At the end of the course, the student shall be able to

Describe the rationale and principle of technical procedures of routine laboratory tests and Interpretations of the results.

c) Integration

At the end of the training he/she shall be able to integrate the cause of disease and relationship of different etiological factors that contribute to the natural history of common diseases.

2. DETAILED SYLLABUS		
Total number of Lectures	-	40 hrs.
Number of hours for practical Demonstration-2x5	-	10 hrs
Total		50 hrs

SYLLABUS OF THEORY CLASSES

Topic

Hours

Introduction and Etiology

1

Degeneration, Apoptosis, Disturbances of metabolism	3
Inflammation and repair	4
Circulatory disturbances	5
Shock	
Oedema	
Thrombosis	
Embolism	
Infraction	
Acute bacterial infection	1
Specific Infection	5
Tuberculosis	
Leprosy	
Fungal Infection	
Viral, Clamydial Infection	
Neoplasia	5
Definitions	
Classifications	
Behaviour of benign and Malignant Neoplasm	
Spread of Tumours	
Etiopathogenesis	
Diagnostic methods	
Haematology	
Introduction and RBC disorders	2
WBC disorders, Plasma cell dyscrasia	2
Bleeding and coagulation disease	2
Clinical Pathology	
Introduction	
Functioning of laboratory	1
Collection of blood sample	
Haematology Technique	1
Examination of Urine	1
Ocular Pathology	7
Infection	
Degenerative conditions	
Ocular manifestation in systemic disease	
Cataract	

Tumours

Reference books:

- CORTON KUMAR AND ROBINS: Pathological Basis of the Disease, 7th Edition, Elsevier, newDelhi, 2004.
- S R Lakhani Susan AD & Caroline JF: Basic Pathology: An introduction to the mechanism of disease, 1993.
- K S Ratnagar: Pathology of the eye & orbit, Jaypee brothers Medical Publishers, 1997

13. PHARMACOLOGY

Objectives

At the end of the course the student shall be able to

1. Describe the pharmacokinetics and pharmacodynamics of commonly used ocular Drugs.
2. Describe the Toxicology of ocular therapeutic agents
3. List the indications and contraindications of ocular drugs
4. Enumerate the drug delivery strategies in Ophthalmic drug use
5. State the diagnostic application of drugs in Ophthalmology

Skill

1. Recognize adverse reactions
2. Communication skill
3. Observe experiments designed for the study of ocular drugs and interrupt them.
4. Scan information on common ocular pharmaceutical preparations.

Syllabus

I. General Pharmacology	Hours
a) Mechanism of drug action	1
b) Pharmacokinetics of ocular drugs	2
c) Factors influencing penetration of ocular drugs	1
d) Adverse drug reactions	1
e) Toxicology of ocular therapeutic agents	1
f) Routes of ocular administration	1
g) Vitamins and Zinc deficiencies	1
II Action of specific agents	

1. CNS depressants	1
2. Anticoagulants, Surgical haemostasis and thrombolytic agents	2
3. Diuretics and hypertensive agents	2
4. Drugs used in cardiac failure, angina and shock	3
5. Histamines, antihistamines and mast cell stabilizers	2
6. Antidepressants	1
7. Prostaglandins and Serotonin	1
8. Ocular toxicity of some systemic drugs	1
III Ophthalmological drug use	
1. Antiglaucoma drugs 3	
a) Drugs which increase the outflow of aqueous humour	34
b) Drugs which decrease the production of aqueous humour by the ciliary body	
c) Ocular hypotensives	
2. Topical antibacterial agents for ophthalmic use	1
3. Antifungal agents for ophthalmic use	1
4. Antiviral agents for ophthalmic	1
5. Therapeutic and diagnostic use of autonomic drugs	2
6. Antiprotozoal agents and antiallergics	1
7. Anti inflammatory agents like glucocorticoids and NSAIDS	1
8. Mydriatics and miotics	1
9. Topical Local anaesthetics	2
10. Miscellaneous drugs like Tear substitutes and Wetting Agents Diagnostic agents – Fluorescein and Rose Bengal Antiseptics – Povidone iodine preservatives in ocular Preparations	1
11. BLS & emergency care	2

Total

37 Hrs.

Text Books Recommended

- Pharmacology and Pharmacotherapeutics, R.S. Sathoskar and S.D. Bhandarkar 19th Edition
- Essential of Medical Pharmacology, K.D. Tripathi, 5th Editon, Jaypee Brothers, New Delhi.
- K D TRIPATHI: Essentials of Medical Pharmacology. 5th edition, Jaypee, New Delhi, 2004

CORE COURSES

1. OPTOMETRIC OPTICS

No.	Topic	No. of Lectures
1	Introduction – Light, Mirror, Reflection, Refraction and Absorption	1
2	Prisms – Definition, properties, Refraction through prisms, Thickness difference, Base-apex notation, uses, nomenclature and units, Sign Conventions, Fresnel's prisms, rotary prims	4
3	Lenses – Definition, units, terminology used to describe, form of lenses	2
4	Vertex distance and vertex power, Effectivity calculations	2
5	Lens shape, size and types i.e. spherical, cylindrical and Sphero-cylindrical	1
6	Transpositions – Simple, Toric and Spherical equivalent	1
7	Prismatic effect, centration, decent ration and Prentice rule, Prismatic effect of Plano-cylinder and Sphero-cylinder lenses	4
8	Spherometer & Sag formula, Edge thickness calculations	3
9	Magnification in high plus lenses, Minification in high minus lenses	1
10	Tilt induced power in spectacles	1
11	Aberration in Ophthalmic Lenses	1

Total Hours	21
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No.	Topic	No. of Lectures
1	Raw materials – History and General Outline, Manufacturing of Ophthalmic Blanks – Glass & Plastics, Terminology used in Lens Workshops, Surfacing process from Blanks to lenses	1 4
2	Definition & Materials (Glass, Plastics, Polycarbonate, Triology) types and Characteristics	4
3	Properties (Refractive index, specific gravity, UV cut off, impact resistance – include drop ball test, abbe value, Center thickness)	4
4	Best form of lenses & Safety standards for Ophthalmic lenses (FDA, ANSI, ISI, Others)	2
5	Design of High Powered Lenses Hi-index lenses, Calculation of Refractive index	2
6	Bifocal designs, their manufacturing & uses (Kryptok, Unis D, Executive, Invisible, Occupational)	6
7	Progressive Addition Lenses, modified near vision lenses (designs, advantages, limitations)	3
8	Lens enhancements (Scratch resistant coatings – spin/dip, Anti-reflection coating, UV coating, Hydrophobic coating, anti-static coating)	4
9	Lens defects – Description and Detection	2
10	Glazing & edging (manual & automatic)	2
11	Special lenses <ul style="list-style-type: none"> ➤ Lenticulars ➤ Aspherics ➤ Fresnel lenses & Prisms ➤ Aniseikonic lenses ➤ Photochromics ➤ Polaroids ➤ Tinted lenses – Tints, filters 	6
12	History of Spectacles, manufacturing overview, Definition, parts & measurements	2

13	Classification of frames – Materials (cover in detail), Colours and Temple position (advantages & disadvantages, where to use)	4
14	Special purpose frames (sports, kids, reading)	1
	Total hours	42

Reference Books:

- David Wilson: Practical Optical Dispensing, OTEN- DE, NSW TAFE Commission, 1999
- C V Brooks, IM Borish: System for Ophthalmic Dispensing, Second edition, Butterworth-Heinemann, USA, 1996
- Jalie M: The principles of Ophthalmic Lenses, The Association of Dispensing Opticians, London, 1972

2. CLINICAL EXAMINATION OF VISUAL SYSTEMS & INSTRUMENTS

सर्वे भवन्तु सुखिनः

Topic	No. of hours
1. REFRACTIVE INSTRUMENTS <ul style="list-style-type: none"> ➤ Optotypes and MTF, Spatial Frequency ➤ Test charts standards. ➤ Choice of test charts ➤ Trial case lenses ➤ Refractor (phoropter) head units ➤ Optical considerations of refractor units ➤ Trial frame design ➤ Near vision difficulties with units and trial frames ➤ Retinoscope – types available ➤ Adjustment of Retinoscopes- special features ➤ Objective optometers. ➤ Infrared optometer devices. ➤ Projection charts ➤ Illumination of the consulting room. ➤ Brightness acuity test ➤ Vision analyzer ➤ Pupilometer , ➤ Potential Acuity Meter, ➤ Abberometer 	12
2. OPHTHALMOSCOPES AND RELATED DEVICES <ul style="list-style-type: none"> ➤ Design of ophthalmoscopes - illumination ➤ Design of ophthalmoscopes- viewing ➤ Ophthalmoscope disc ➤ Filters for ophthalmoscopy ➤ Indirect ophthalmoscope 	3 hours
3. Lensometer, Lens gauges or clock	2 hours
4. Slit Lamp	2 hours
5. Tonometers	2 hours
6. Keratometer and corneal topography	2 hours
7. Refractometer	1 hour
8. Orthoptic Instruments (Synaptophore Only)	1 hour

9. Color Vision Testing Devices	1 hour
10. Fields Of Vision And Screening Devices	2 hours
11. Scans	1 hour
12. ERG	1 hour
13. New Instruments	2 hours
14. Automation in Optometry	2 hours
Total no. hrs	34 hours

Reference books:

- **P R Yoder**: Mounting Optics in Optical Instruments, SPIE Society of Photo-Optical Instrumentation, 2002
- **G Smith, D A. Atchison**: The Eye and Visual Optical Instruments, Cambridge University Press, 1997
- David Henson: Optometric Instrumentations, Butterworth- Heinnemann, UK, 1991

CLINICAL EXAMINATION OF VISUAL SYSTEMS

Sl. No.	Topic	No. of hours
1.	History taking,	4
2.	Visual acuity estimation	1
3.	Extraocular motility, Cover test, Alternating cover test	2
4.	Hirschberg test, Modified Krimsky,	1
5.	Pupils Examination	1
6.	Maddox Rod,	1
7.	van Herrick,	1
8.	External examination of the eye, Lid Eversion	1

9.	Schirmer's, TBUT, tear meniscus level, NITBUT (keratometer),	2
10.	Color Vision	1
11.	Stereopsis,	1
12.	Confrontation test,	1
13.	Photostress test,	1
14.	Slitlamp biomicroscopy,	3
15.	Direct Ophthalmoscopy,	1
16.	Digital pressure, Schiötz Tonometry, Applanation Tonometry Gonioscopy	3
17.	ROPLAS	1
18.	Amsler test,	1
19.	Corneal Sensitivity, HVID	1
20.	Saccades and Pursuits	1
	Total no. hours	29

Reference Books:

- T Grosvenor: Primary Care Optometry, 5th edition, Butterworth – Heineman, USA, 2007.
- A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007
- [D B. Elliott](#) :Clinical Procedures in Primary Eye Care,3rd edition, Butterworth-Heinemann, 2007
- [Jack J. Kanski](#) Clinical Ophthalmology: A Systematic Approach,6th edition, Butterworth-Heinemann, 2007
- J.B Eskridge, J F. Amos, J D. Bartlett: Clinical Procedures in Optometry, Lippincott Williams and Wilkins,1991
- [N B. Carlson](#) , [DI Kurtz](#): Clinical Procedures for Ocular Examination ,3rd edition, McGraw-Hill Medical, 2003
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3. VISUAL OPTICS

Topic	No. of hours
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<p>1. REVIEW OF GEOMETRICAL OPTICS</p> <p>VERGENCE AND POWER:</p> <p>1.1 Conjugacy, object space and image space 1.2 Sign convention 1.3 Spherical refracting surface 1.4 Spherical mirror; catoptric power 1.5 Cardinal points 1.6 Magnification 1.7 Light and visual function Clinical Relevance of: Fluorescence, Interference, Diffraction, Polarization, Bi-refringence, Dichroism 1.9 Aberration and application Spherical and Chromatin</p>	<p>4 hours</p>
<p>2. OPTICS OF OCULAR STRUCTURE</p> <p>2.1 Cornea and aqueous 2.2 Crystalline lens 2.3 Vitreous 2.3 Schematic and reduced eye</p>	<p>2 hours</p>
<p>3. MEASUREMENTS OF OPTICAL CONSTANTS OF THE EYE</p> <p>3.1 Corneal curvature and thickness 3.2 Keratometry 3.3 Curvature of the lens and ophthalmophakometry 3.4 Axial and axis of the eye 3.5 Basic Aspects of Vision.</p> <ul style="list-style-type: none"> • Visual Acuity • Light and Dark Adaptation • Color Vision • Spatial and Temporal Resolution • Science of Measuring visual performance and Clinical Optometry <p style="text-align: right;">Application to</p>	<p>8 hours</p>
<p>4. REFRACTIVE ANOMALIES AND THEIR CAUSES</p> <p>4.1 Etiology of refractive anomalies 4.2 Contributing variability and their ranges 4.3 Populating distributions of anomalies. 4.4 Optical component measurements 4.5 Growth of the eye in relation to refractive errors</p>	<p>6 hours</p>
<p>Total hours</p>	<p>20 hours</p>

Topic	No. of hours
1.Refractive conditions <ul style="list-style-type: none"> ➤ Emmetropia ➤ Myopia ➤ Hyperopia ➤ Astigmatism ➤ Accommodation ➤ Presbyopia ➤ Anisometropia and Aniseikonia ➤ Aphakia and Pseudophakia 	9 hours
2.Accommodation <ul style="list-style-type: none"> ➤ Far and near points of accommodation ➤ Correction of spherical ametropia ➤ Axial versus refractive ametropia ➤ Relationship between accommodation and convergence, AC / A ratio 	6 hours
3.Objective refraction <ul style="list-style-type: none"> ➤ Streak Retinoscopy only 	3 Hours
4.Subjective Refraction <ul style="list-style-type: none"> ➤ Review of subjective refractive methods ➤ Cross cylinder methods for astigmatism, Astigmatic Fan Test ➤ Difficulties in subjective and objective tests and their avoidance ➤ Ocular refraction versus spectacle refraction ➤ Ocular accommodation versus spectacle accommodation ➤ Spectacle magnification and relative spectacle magnification ➤ Retinal image blur; depth of focus and depth of field ➤ Prescribing Prisms / Binocular Refraction 	9 hours
Total no. of hours	27 hours

Reference Books:

- A H Tunnacliffe: Visual optics, The Association of British Optician, 1987
- AG Bennett & RB Rabbets: Clinical Visual optics, 3rd edition, Butterworth Heinemann, 1998
- M P Keating: Geometric, Physical and Visual optics, 2nd edition, Butterworth- Heinemann, USA, 2002
- HL Rubin: Optics for clinicians, 2nd edition, Triad publishing company. Florida, 1974.
- H Obstfeld: Optic in Vision- Foundations of visual optics & associated computations, 2nd edition, Butterworth, UK, 1982.

- WJ Benjamin: Borish's clinical refraction, 2nd edition, Butterworth Heinemann, Missouri, USA, 2006
- T Grosvenor: Primary Care Optometry, 4th edition, Butterworth – heinneman, USA, 2002

THIRD YEAR

4. SYSTEMIC DISEASE MEDICINE

No	Topics	Number of Lectures
1	<p>Hypertension</p> <ul style="list-style-type: none"> ➤ Definition, classification, Epidemiology, clinical examination, complications, and management. ➤ Hypertensive retinopathy 	4
2	<p>Diabetes Mellitus</p> <ul style="list-style-type: none"> ➤ Classification, pathophysiology, clinical presentations, diagnosis, and management, Complications ➤ Diabetic Retinopathy 	4
3	<p>Thyroid Disease</p> <ul style="list-style-type: none"> ➤ Physiology, testing for thyroid disease, Hyperthyroidism, Hypothyroidism, Thyroiditis, Thyroid tumors ➤ Grave's Ophthalmopathy 	4
3	<p>Acquired Heart Disease</p> <ul style="list-style-type: none"> ➤ Ischemic Heart Disease, Congestive heart failure, Disorders of cardiac rhythm ➤ Ophthalmic considerations 	4
4	<p>Cancer :</p> <ul style="list-style-type: none"> ➤ Incidence ➤ Etiology ➤ Therapy ➤ Ophthalmologic considerations 	4
5	<p>Connective Tissue Disease</p> <ul style="list-style-type: none"> ➤ Rheumatic arthritis ➤ Systemic lupus erythematosus ➤ Scleroderma ➤ Polymyositis and dermatomyositis ➤ Sjogren syndrome ➤ Behcet's syndrome ➤ Eye and connective tissue disease 	4
6	<p>Tuberculosis</p> <ul style="list-style-type: none"> ➤ Aetiology, pathology, clinical features, pulmonary tuberculosis, diagnosis, complications, treatment tuberculosis and the eye. 	4

7	Herpes virus (Herepes simplex, Varicella Zoster, Cytomegalovirus, Epstein Barr Virus) Herpes and the eye	3
8	Hepatitis (Hepatitis A, B, C)	2
9	Acquired Immunodeficiency Syndrome	4
10	Anemia (Diagnosis, clinical evaluation, consequences, Sickle cell disease, treatment, Ophthalmologic considerations)	2
9	Common Tropical Medical Ailments <ul style="list-style-type: none"> ➤ Malaria ➤ Typhoid ➤ Dengue ➤ Filariases ➤ Onchocerciasis ➤ Cysticercosis ➤ Leprosy 	4
10	Nutritional and Metabolic disorders: <ul style="list-style-type: none"> ➤ Obesity ➤ Hyperlipidaemias ➤ Kwashiorkor ➤ Vitamin A Deficiency ➤ Vitamin D Deficiency ➤ Vitamin E Deficiency ➤ Vitamin K Deficiency ➤ Vitamin B1,B2, Deficiency ➤ Vitamin C Deficiency 	2
11	Myasthenia Gravis	2
12	<ul style="list-style-type: none"> ➤ First Aid ➤ General Medical Emergencies ➤ Preoperative precautions in ocular surgeries 	4
13	Psychiatry <ul style="list-style-type: none"> ➤ Basic knowledge of psychiatric condition and ➤ Patient Management 	2
14	Genetics <ul style="list-style-type: none"> ➤ Introduction to genetics ➤ Organisation of the cell 	4

	<ul style="list-style-type: none"> ➤ Chromosome structure and cell division ➤ Gene structure and basic principles of Genetics. ➤ Genetic disorders and their diagnosis. ➤ Genes and the eye ➤ Genetic counseling and genetic engineering. ➤ 	
	Total Number of Lectures	57

Reference Book :

1. Davidson's Principles and Practice of Medicine
2. K.V. Krishnad's - Textbook of Medicine

Examination Pattern

Theory & Practical at end of VI Semester as per the syllabus of KUHS

5. EYE DISEASES

S. No.	Topics	No. of Lectures
1.	<p>a) ORBIT</p> <ul style="list-style-type: none"> ➤ Applied Anatomy ➤ Proptosis Classification,Causes,Investigations) ➤ Enophthalmos ➤ Developmental Anomalies (craniosynostosis, Craniofacial Dysostosis, Hypertelorism, Median facial cleft syndrome) ➤ Orbital Inflammations (Preseptal cellulites, Orbital cellulitis Orbital Periostitis, cavernous sinus Thrombosis) ➤ Grave's Ophthalmopathy ➤ Orbital tumors(Dermoids, capillary haemangioma, Optic nerve glioma) ➤ Orbital blowout fractures ➤ Orbital surgery (Orbitotomy) ➤ Orbital tumors ➤ Orbital trauma ➤ Approach to a patient with proptosis 	10
2.	<p>b) LIDS</p> <p>Applied Anatomy</p> <ul style="list-style-type: none"> ➤ Congenital anomalies (Ptosis, Coloboma, Epicanthus, Distichiasis, Cryptophthalmos) 	6

	<ul style="list-style-type: none"> ➤ 3.Oedema of the eyelids (Inflammatory, Solid, Passive edema) ➤ Inflammatory disorders (Blepharitis, External Hordeolum, Chalazion, Internal hordeolum,,Molluscum Contagiosum) ➤ Anomalies in the position of the lashes and Lid Margin (Trichiasis, Ectropion, Entropion, Symblepharon, Blepharophimosis, Lagophthalmos, Blepharospasm, Ptosis). ➤ Tumors (Papillomas, Xanthelasma, Haemangioma, Basal carcinoma, Squamous cell carcinoma, sebaceous gland melanoma) 	
3.	<p>c) LACRIMAL SYSTEM</p> <ul style="list-style-type: none"> ➤ Applied Anatomy ➤ Tear Film ➤ The Dry Eye (Sjogren’s Syndrome) ➤ The watering eye (Etiology, clinical evaluation) ➤ Dacryocystitis ➤ Swelling of the Lacrimal gland (Dacryoadenitis) 	4
4.	<p>d) CONJUNCTIVA</p> <ul style="list-style-type: none"> ➤ Applied Anatomy ➤ Inflammations of conjunctiva (Infective conjunctivitis – bacterial, chlamydial, viral , Allergic conjunctivitis, Granulomatous conjunctivitis) ➤ Degenerative conditions (Pinguecula, Pterygium, Concretions) ➤ Symptomatic conditions (Hyperaemia, Chemosis, Ecchymosis, Xerosis, Discoloration) ➤ 5.Cysts and Tumors 	4
5.	<p>e) CORNEA</p> <ul style="list-style-type: none"> ➤ Applied Anatomy and Physiology ➤ Congenital Anomalies (Megalocornea, Microcornea, Cornea plana, Congenital cloudy cornea) ➤ Inflammations of the cornea (Topographical classifications: Ulcerative keratitis and Non ulcerative) ➤ Etiological classifications: Infective, Allergic, Trophic, Traumatic, Idiopathic) ➤ Degenerations (classifications, Arcus senilis, Vogt’s white limbal girdle, Hassal-henle bodies, Lipoid Keratopathy, Band shaped keratopathy, Salzmann’s nodular degeneration, Droplet keratopathy, Pellucid Marginal degeneration) ➤ Dystrophies (Reis Buckler dystrophy,Recurrent corneal erosion syndrome, Granualr dystrophy,Lattice dystrophy, Macular dystrophy, cornea guttata, Fuch’s epithelial endothelial dystrophy, Congenital hereditary endothelial dystrophy) 	12

	<ul style="list-style-type: none"> ➤ Keratoconus, Keratoglobus ➤ Corneal oedema, Corneal opacity, Corneal vascularisation ➤ Penetrating Keratoplasty 	
6.	<p>f) UVEAL TRACT AND SCLERA</p> <ul style="list-style-type: none"> ➤ Applied Anatomy, ➤ Classification of uveitis ➤ Etiology ➤ Pathology ➤ Anterior Uveitis ➤ Posterior Uveitis ➤ Purulent Uveitis ➤ Endophthalmitis ➤ Panophthalmitis ➤ Pars Planitis ➤ Tumors of uveal tract(Melanoma) ➤ Episcleritis and scleritis ➤ Clinical examination of Uveitis and Scleritis 	10
7.	<p>Retina and Vitreous:</p> <ul style="list-style-type: none"> ➤ Applied Anatomy ➤ Congenital and Developmental Disorders (Optic Disc: Coloboma, Drusen, Hypoplasia, Medullated nerve fibers; Persistent Hyaloid Artery) ➤ Inflammatory disorders (Retinitis : Acute purulent , Bacterial, Virus, mycotic) ➤ Retinal Vasculitis (Eales's) ➤ Retinal Artery Occlusion (Central retinal Artery occlusion) ➤ Retinal Vein occlusion (Ischaemic, Non Ischaemic , Branch retinal vein occlusion) ➤ Retinal degenerations : Retinitis Pigmentosa, Lattice degenerations ➤ Macular disorders: Solar retinopathy, central serous retinopathy, cystoid macular edema, Age related macular degeneration. ➤ Retinal Detachment: Rhegmatogenous, Tractional, Exudative) ➤ Retinoblastoma 	12

8.	<p>Ocular Injuries:</p> <p>Terminology : Closed globe injury (contusion, lamellar laceration) Open globe injury (rupture, laceration, penetrating injury, perforating injury)</p> <p>Mechanical injuries (Extraocular foreign body, blunt trauma, perforating injury, sympathetic ophthalmitis)</p> <ul style="list-style-type: none"> ➤ Non Mechanical Injuries (Chemical injuries, Thermal, Electrical, Radiational) ➤ Clinical approach towards ocular injury patients 	4
9.	<p>Lens</p> <ul style="list-style-type: none"> ➤ Applied Anatomy and Physiology ➤ Clinical examination ➤ Classification of cataract ➤ Congenital and Developmental cataract ➤ Acquired (Senile, Traumatic, Complicated, Metabolic, Electric, Radiational, Toxic) ➤ Morphological: Capsular, Subcapsular, Cortical, Supranuclear, Nuclear, Polar. ➤ Management of cataract (Non surgical and surgical measures; preoperative evaluation, Types of surgeries,) ➤ Complications of cataract surgery ➤ Displacement of lens: Subluxation, Displacement ➤ Lens coloboma, Lenticonus, Microspherophakia. 	10
10.	<p>Clinical Neuro-ophthalmology</p> <ul style="list-style-type: none"> ➤ Anatomy of visual pathway ➤ Lesions of the visual pathway ➤ Pupillary reflexes and abnormalities (Amaurotic light reflex, Efferent pathway defect, Wernicke's hemianopic pupil, Marcus gunn pupil. Argyll Robertson pupil, Adie's tonic pupil) ➤ Optic neuritis, Anterior Ischemic optic neuropathy, Pappilloedema, optic atrophy ➤ Cortical blindness ➤ Malingering ➤ Nystagmus ➤ Clinical examination 	12
11.	<p>Glaucoma</p> <ul style="list-style-type: none"> ➤ Applied anatomy and physiology of anterior segment ➤ Clinical Examination 	10

	<ul style="list-style-type: none"> ➤ Definitions and classification of glaucoma ➤ Pathogenesis of glaucomatous ocular damage ➤ Congenital glaucomas ➤ Primary open angle glaucoma ➤ Ocular hypertension ➤ Normal Tension Glaucoma ➤ Primary angle closure glaucoma (Primary angle closure suspect, Intermittent glaucoma, acute congestive, chronic angle closure) ➤ Secondary Glaucomas ➤ Management : common medications, laser intervention and surgical techniques 	
	Total hours	92

1) Reference Books:

- A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007
- [Stephen J. Miller](#) : Parsons Diseases of the Eye, 18th edition, Churchill Livingstone, 1990
- [Jack J. Kanski](#) Clinical Ophthalmology: A Systematic Approach, 6th edition, Butterworth - Heinemann, 2007

CLINICS

- Case Sheet
- History taking
- Test for phorias and tropias
- External Examination
- Slit Lamp Examination
- Drugs & Methods of application
- Dos – Don't's – Pupillary dilatation
- Direct Ophthalmology
- Indirect Ophthalmology

6. **DISPENSING OPTICS & MECHANICAL OPTICS CONTACT**

LENS & LOW VISION AIDS

DISPENSING OPTICS – MECHANICAL OPTICS

No.	Topic	No. of Lectures
1	Components of spectacle prescription & interpretation, transposition, Add and near power relation	1
2	Frame selection – based on spectacle prescription, professional requirements, age group, face shape	4
3	Measuring Inter-pupillary distance (IPD) for distance & near, bifocal height	1
4	Lens & Frame markings, Pupillary centers, bifocal heights, Progressive markings & adjustments – facial wrap, pantoscopic tilt	1
5	Recording and ordering of lenses (power, add, diameter, base, material, type, lens enhancements)	1
6	Neutralization – Hand & lensometer, axis marking, prism marking	3
7	Faults in spectacles (lens fitting, frame fitting, patients complaints, description, detection and correction)	2
8	Final checking & dispensing of spectacles to customers, counseling on wearing & maintaining of spectacles, Accessories – Bands, chains, boxes, slevets, cleaners, screwdriver kit	2
9	Spectacle repairs – tools, methods, soldering, riveting, frame adjustments	1
10	Special types of spectacle frames <ul style="list-style-type: none"> ➤ Monocles ➤ Ptosis crutches ➤ Industrial safety glasses ➤ Welding glasses 	1
12	Frame availability in Indian market	2
13	FAQ's by customers and their ideal answers	2
	Total number of Hours	21

Reference Book:

- David Wilson, Steve stenersen: Practical optical workshop, OTEN- DE, NSW TAFE Commission, 2002
- Margaret Dowaliby: Practical Aspects of Ophthalmic optics, Fourth edition, Butterworth Heinemann, USA, 2001
- David Wilson: Practical Optical Dispensing, OTEN- DE, NSW TAFE Commission, 1999

- C V Brooks, IM Borish: System for Ophthalmic Dispensing, Second edition, Butterworth-Heinemann, USA, 1996

CONTACT LENS

No.	Topics	No of Lecture(s)
1.	Introduction to Contact lenses ➤ Definition ➤ Classification / Types	1
2.	History of Contact Lenses	1
3.	Optics of Contact Lenses ➤ Magnification & Visual field ➤ Accommodation & Convergence ➤ Back & Front Vertex Power / Vertex distance calculation	3
4.	Review of Anatomy & Physiology of ➤ Tear film ➤ Cornea ➤ Lids & Conjunctiva	2
5.	Introduction to CL materials ➤ Monomers, Polymers	2
6.	Properties of CL materials ➤ Physiological (Dk, Ionicity, Water content) ➤ Physical (Elasticity, Tensile strength, Rigidity) ➤ Optical (Transmission, Refractive index)	3
7.	Indications and contraindications	2
8.	Parameters / Designs of Contact Lenses & Terminology	3
9.	RGP Contact Lens materials	1
10.	Manufacturing Rigid and Soft Contact Lenses – various methods	1
11.	Pre-Fitting examination – steps, significance, recording of results	3
12.	Correction of Astigmatism with RGP lens	2

13.	Types of fit – Steep, Flat, Optimum – on spherical cornea with spherical lenses	1
14.	Types of fit – Steep, Flat, Optimum – on Toric cornea with spherical lenses	1
15.	Calculation and finalising Contact lens parameters	1
16.	Ordering Rigid Contact Lenses – writing a prescription to the Laboratory	1
17.	Checking and verifying Contact lenses from Laboratory	1
18.	Modifications possible with Rigid lenses	1
19.	Common Handling Instructions <ul style="list-style-type: none"> ➤ Insertion & Removal Techniques ➤ Do's and Dont's 	1
20.	Care and Maintenance of Rigid lenses <ul style="list-style-type: none"> ➤ Cleaning agents & Importance ➤ Rinsing agents & Importance ➤ Disinfecting agents & importance ➤ Lubricating & Enzymatic cleaners 	3
21.	Follow up visit examination	1
22.	Complications of RGP lenses	2
23.	SCL Materials & Review of manufacturing techniques	2
24.	Comparison of RGP vs. SCL	1
25.	Pre-fitting considerations for SCL	2
26.	Fitting philosophies for SCL	1
27.	SCL fitting assessment	2
28.	Types of fit – Steep, Flat, Optimum	3
29.	Calculation and finalising SCL parameters	2
30.	Disposable lenses <ul style="list-style-type: none"> a) Advantages and availability 	1
31.	Soft Toric CL <ul style="list-style-type: none"> ➤ Stabilization techniques ➤ Parameter selection 	2

	➤ Fitting assessment	
32.	Common Handling Instructions ➤ Insertion & Removal Techniques ➤ Do's and Dont's	1
33.	Care and Maintenance of Soft lenses ➤ Cleaning agents & Importance ➤ Rinsing agents & Importance ➤ Disinfecting agents & importance ➤ Lubricating & Enzymatic cleaners	2
34.	Follow up visit examination	2
35.	Complications of Soft lenses	4
36.	Therapeutic contact lenses ➤ Indications ➤ Fitting consideration	1
37.	Specialty fitting ➤ Aphakia ➤ Pediatric ➤ Post refractive surgery	3
38.	Introduction to Bifocal CL	1
	Total Number of lectures	67

Reference Books

- IACLE modules 1 - 10
- CLAO Volumes 1, 2, 3
- [Anthony J. Phillips](#) : Contact Lenses, 5th edition, Butterworth-Heinemann, 2006
- [Elisabeth A. W. Millis](#): Medical Contact Lens Practice, Butterworth-Heinemann, 2004
- [E S. Bennett ,V A Henry](#) :Clinical manual of Contact Lenses, 3rd edition, Lippincott Williams and Wilkins, 2008

LOW VISION AID

	Topics	Number of lectures
1	Definitions & classification of Low vision	1
2	Epidemiology of low vision Model of low vision service	1
3	Pre-clinical evaluation of low vision patients – prognostic & psychological factors; psycho-social impact of low vision	1
4	Types of low vision aids – optical aids, non-optical aids & electronic devices	3
5	Optics of low vision aids	1
6	Clinical evaluation – assessment of visual acuity, visual field, selection of low vision aids, instruction & training	3
7	Pediatric Low Vision care	4
8	Low vision aids – dispensing & prescribing aspects	1
9	Visual rehabilitation & counseling	1
10	Legal aspects of Low vision in India	1
11	Case Analysis	5
	Total hours	21

Reference Books:

- [Richard L. Brilliant](#): Essentials of Low Vision Practice, Butterworth-Heinemann, 1999
- Helen Farral: optometric Management of Visual Handicap, Blackwell Scientific publications, 1991
- A J Jackson, J S Wolffsohn: Low Vision Manual, Butterworth Heinemann, 2007
- [Christine Dickinson](#): Low Vision: Principles and Practice Low vision care, 4th edition, Butterworth-Heinemann, 1998
- E Vaithilingam: practice of Low vision – A guide book, Medical Research Foundation, 2000.

7. BINOCULAR VISION & SQUINT

No.	Name of the topic	Number of lectures
1.	<p>Binocular Vision and Space perception.</p> <ul style="list-style-type: none"> ➤ Relative subjective visual direction. ➤ Retino motor value ➤ Grades of BSV ➤ SMP and Cyclopean Eye ➤ Correspondence, ➤ Fusion, Diplopia, Retinal rivalry ➤ Horopter ➤ Physiological Diplopia and Suppression ➤ Stereopsis, Panum's area, BSV. ➤ Stereopsis and monocular clues - significance. ➤ Egocentric location, clinical applications. ➤ Theories of Binocular vision. 	6
2.	<p>Anatomy of Extra Ocular Muscles.</p> <ul style="list-style-type: none"> ➤ Rectii and Obliques, LPS. ➤ Innervation & Blood Supply. <p>Physiology of Ocular movements.</p> <ul style="list-style-type: none"> ➤ Center of rotation, Axes of Fick. ➤ Action of individual muscle. <p>Laws of ocular motility</p> <ul style="list-style-type: none"> ➤ Donders' and Listing's law ➤ Sherrington's law ➤ Hering's law <p>Unocular & Binocular movements - fixation, saccadic & pursuits.</p> <ul style="list-style-type: none"> ➤ Version & Vergence. ➤ Fixation & field of fixation 	4

3.	<p>Near Vision Complex</p> <p>Accommodation</p> <ul style="list-style-type: none"> ➤ Definition and mechanism (process). ➤ Methods of measurement. ➤ Stimulus and innervation. ➤ Types of accommodation. ➤ Anomalies of accommodation – aetiology and management. 	3
4.	<p>Convergence</p> <ul style="list-style-type: none"> ➤ Definition and mechanism. ➤ Methods of measurement. ➤ Types and components of convergence - Tonic, accommodative, fusional, proximal. ➤ Anomalies of Convergence – aetiology and management. 	5
5.	<p>Sensory adaptations Confusion</p>	1
6.	<p>Suppression Investigations</p> <p>Management Blind spot syndrome</p>	4
7.	<p>Abnormal Retinal Correspondence</p> <p>Investigation and management</p> <p>Blind spot syndrome</p>	1
8.	<p>Eccentric Fixation</p> <p>Investigation and management</p>	1
9.	<p>Amblyopia Classification</p> <p>Aetiology Investigation Management</p>	4
10	<p>Neuro-muscular anomalies</p> <p>Classification and etiological factors</p>	1
11	<p>History – recording and significance.</p>	1
12	<p>Convergent strabismus</p> <ul style="list-style-type: none"> ➤ Accommodative convergent squint ➤ Classification ➤ Investigation and Management ➤ B Non accommodative Convergent squint ➤ Classification 	4

	➤ Investigation and Management	
13	Divergent Strabismus Classification A& V phenomenon Investigation and Management	3
14	Vertical strabismus Classification Investigation and Management	1
15	Paralytic Strabismus Acquired and Congenital Clinical Characteristics Distinction from comitant and restrictive Squint	3
16	Investigations ➤ History and symptoms ➤ Head Posture ➤ Diplopia Charting ➤ Hess chart ➤ PBCT ➤ Nine directions ➤ Binocular field of vision	12
17	Non surgical Management of Squint	2
18	Restrictive Strabismus Features ➤ Musculo fascical anomalies ➤ Duane's Retraction syndrome ➤ Clinical features and management ➤ Brown's Superior oblique sheath syndrome ➤ Strabismus fixus ➤ Congenital muscle fibrosis	3

19	Surgical management	1
	Total Number of Hours	60

Reference Books

- Pradeep Sharma: Strabismus simplified, New Delhi, First edition, 1999, Modern publishers.
- Fiona J. Rowe: Clinical Orthoptics, second edition, 2004, Blackwell Science Ltd
- Gunter K. Von Noorden: BURIAN- VON NOORDEN'S Binocular vision and ocular motility theory and management of strabismus, Missouri, Second edition, 1980, C. V. Mosby Company
- Mitchell Scheiman; Bruce Wick: [Clinical Management of Binocular Vision](#) Heterophoric, Accommodative, and Eye Movement Disorders, 2008, Lippincot Williams & Wilkins publishers

8. COMMUNITY OPTOMETRY

Unit 1

PAEDIATRIC, GERIATRIC OPTOMETRY

No	Topics	Number of Lectures
1	The Development of Eye and Vision	2
2	History taking Paediatric subjects	2
3	Assessment of visual acuity	1
4	Normal appearance, pathology and structural anomalies of	2
	a) Orbit, Eye lids, Lacrimal system,	
	b) Conjunctiva, Cornea, Sclera	2
	Anterior chamber, Uveal tract, Pupil	
	c) Lens, vitreous, Fundus	1

	Oculomotor system	
5	Refractive Examination	2
6	Determining binocular status	1
7	Determining sensory motor adaptability	1
8	Compensatory treatment and remedial therapy for : Myopia, Pseudomyopia, Hyperopia, Astigmatism, Anisometropia, Amblyopia	2
9	Remedial and Compensatory treatment of Strabismus and Nystagmus	2
10	Paediatric eye disorders : Cataract, Retinopathy of Prematurity, Retinoblastoma, Neuromuscular conditions (myotonic dystrophy, mitochondrial cytopathy), and Genetics	3
11	Anterior segment dysgenesis, Aniridia, Microphthalmos, Coloboma, Albinism	2
12	Spectacle dispensing for children	3
13	Paediatric contact lenses	2
14	Low vision assessment in children	2
	Total Number of Lectures	30

References:

- Binocular Vision and Ocular Motility - VON NOORDEN G K Burian Von Noorden's, 2nd Ed., C.V.Mosby Co. St. Louis, 1980.
- Assessing Children's Vision. By Susan J Leat, Rosalyn H Shute, Carol A Westall.45 Oxford: Butterworth-Heinemann, 1999.
- Clinical pediatric optometry. LJ Press, BD Moore, Butterworth- Heinemann, 1993
- Pediatric Optometry - JEROME ROSNER, Butterworth, London 1982
- Paediatric Optometry – William Harvey/ Bernard Gilmartin, Butterworth –Heinemann, 2004

GERIATRIC OPTOMETRY

No.	Topics	Number of Lectures
1	Structural , and morphological changes of eye in elderly	2
2	Physiological changes in eye in the course of aging.	2
3	Introduction to geriatric medicine – epidemiology , need for optometry care, systemic diseases (Hypertension, Atherosclerosis, coronary heart disease, congestive Heart failure, Cerebrovascular disease, Diabetes, COPD)	3
4	Optometric Examination of the Older Adult	2
5	Ocular diseases common in old eye, with special reference to cataract, glaucoma, macular disorders, vascular diseases of the eye	4
6	Contact lenses in elderly	1
7	Pharmacological aspects of aging	2
8	Low vision causes, management and rehabilitation in geriatrics.	4
9	Spectacle dispensing in elderly – Considerations of spectacle lenses and frames	4
	Total Number of Lectures	25

Reference Books:

- OP Sharma: Geriatric Care – A textbook of geriatrics and Gerontology, viva books, New Delhi, 2005
- VS Natarajan: An update on Geriatrics, Sakthi Pathipagam, Chennai, 1998
- DE Rosenblatt, VS Natarajan: Primer on geriatric Care A clinical approach to the older patient, Printers Castle, Cochin, 2002
- A.J. ROSSENBLUM Jr & M.W.MORGAN: Vision and Aging, Butterworth-Heinemann, Missouri, 2007.

Unit 2

PUBLIC HEALTH & COMMUNITY OPTOMETRY

No.	Topics	No of Lectures
1	Public Health Optometry: Concepts and implementation	1
2	Dimensions, determinants and indicators of health	1
3	Levels of disease prevention and levels of health care patterns	1
4	Epidemiology of blindness – Defining blindness and visual impairment	1
5	Eye in primary health care	1
6	Contrasting between Clinical and community health programs	2
7	Community Eye Care Programs	4
8	Community based rehabilitation programs	2
9	Nutritional Blindness with reference to Vitamin A deficiency	1
10	Vision 2020: The Right to Sight	3
11	Screening for eye diseases	4
12	National and International health agencies, NPCB	2

13	Role of an optometrist in Public Health	1
14	Organization and Management of Eye Care Programs – Service Delivery models	1
15	Health manpower and planning & Health Economics	1
16	Evaluation and assessment of health programmes	1
17	Optometrists role in school eye health programmes	1
18	Basics of Tele Optometry and its application in Public Health	2
19	Information, Education and Communication for Eye Care programs	1
	Total Lectures	26

Reference books:

- MC Gupta, Mahajan BK, Murthy GVS, 3rd edition. Text Book of Community Medicine, Jaypee Brothers, New Delhi, 2002
- GVS Murthy, S K Gupta, D Bachani: The principles and practice of community Ophthalmology, National programme for control of blindness, New Delhi, 2002
- Newcomb RD, Jolley JL : Public Health and Community Optometry, Charles C Thomas Publisher, Illinois, 1980
- K Park: Park's Text Book of Preventive and Social Medicine, 19th edition,
- Banarsidas Bhanot publishers, Jabalpur, 2007

Unit 3

OCCUPATIONAL HEALTH OPTOMETRY

No.	Topics	No of Lectures
1	Introduction to Occupational health, hygiene and safety, international bodies like ILO, WHO, National bodies etc Acts and Rules - Factories Act, WCA,ESI Act.	2
2	Electromagnetic Radiation and its effects on Eye	2
3	Light – Definitions and units, Sources, advantages and disadvantages, standards	2
4	Color – Definition, Color theory, Color coding, Color defects, Color Vision tests	2
5	Occupational hazards and preventive/protective methods	2
5	Task Analysis	2
6	Industrial Vision Screening – Modified clinical method and Industrial Vision test	2
4	Vision Standards – Railways, Roadways, Airlines	2
5	Visual Display Units	2
6	Contact lens and work	2
	TOTAL NO. OF LECTURES	20

Reference books:

- R V North: Work and the eye, Second edition, Butterworth Heinemann, 2001
- G W Good: Occupational Vision Manual available in the following website: www.aoa.org
- N.A. Smith: Lighting for Occupational Optometry, HHSC Handbook Series, Safchem Services, 1999
- J Anshel: Visual Ergonomics Handbook, CRC Press, 2005
- G Carson, S Doshi, W Harvey: Eye Essentials: Environmental & Occupational Optometry, Butterworth-Heinemann, 2008

Unit 4

LAW AND OPTOMETRY

- Laws governing medical and paramedical professions
- Consumer act with respect to optometry and dispensing optical aids
- International optometry – Important foreign optometry law
- Personal and professional Insurance(indemnity)
- Employment and contracts
- Partnership and alternatives
- Ethics
- Negligence
- Laws governing practice of medical profession and para-medical profession In India
- Registered medical practitioner – laws against practice of medicine of those unregistered – Medical Council of India – Dental Council – Nursing council
- Present rules and regulations – Laws regarding optical product manufacturers – dispensing in India

Unit 5

THEATRE TECHNIQUES & STERILIZATION TECHNIQUES

- Staffing and categories of people in OT
- Physical set up and general function of OT
- Operation table, anesthetic table, preparation of eye pad, cotton swab
- General procedures, setting up of sterile trolley, scrubbing gowning, gloving
- Sterilization and disinfection-Boiling, autoclaving dry heat, chemical disinfection
- Surgical instruments- general and ophthalmic, specifications and use of ophthalmic surgical instruments. Cleaning and maintenance of surgical instruments.

- Common ophthalmic surgeries, setting up of instruments for common eye surgeries
- Preparation of patients for eye surgeries
- Anesthesia, type, general local spinal etc , Retro bulbar

2.10 Content of each subject in each year

FIRST YEAR

Internal Examination only

- English
- Mathematics
- Basics in applied Chemistry

University Examination

- Physical Optics & Geometrical Optics
- General Anatomy
- Ocular Anatomy
- General Physiology
- Ocular Physiology

SECOND YEAR

Internal Examination only

- Information Technology

University Examination

- Nutrition & Biochemistry
- Pharmacology
- Microbiology
- Pathology

- Optometric Optics
- Clinical Examination of Visual System & Instruments
- Visual Optics

CLINICS – 18 hours / week

THIRD YEAR

Internal Examination only

- Systemic Diseases Medicine
- Project

University Examination

- Eye Diseases
- Contact Lens
- Low Vision aid , Dispensing Optics & Mechanical Optics
- Binocular Vision & Squint
- Community Optometry

CLINICS– 20 hours / week

FOURTH YEAR

Project work may be done in the training period (internship), as two separate projects. The projects will be monitored by the HOD with appropriate guidance.

Project 1 will be scientific study

Project 2 will be a community based study.

Specialty training

Speciality training may be carried out in the following at the discretion of the Head of Department and availability of resources

1. Ophthalmic Theatre Techniques
2. Refraction and Contact Lenses
3. Mechanical Optics
4. Paediatric Ophthalmology & Orthoptics
5. Community Ophthalmology
6. Ophthalmic Instrumentation Photography (Advanced & Basic)

2.11 No: of hours per subject

As per [“Teaching learning methods “ and “Content of each subject in each year “] above.

2.12 Practical training

As per [“Teaching learning methods “ and “Content of each subject in each year “] above.

2.13 Records :

To be maintained for all Practical Work

2.14 Dissertation:

Not Applicable

2.15 Speciality training if any

As per [“Teaching learning methods “ and “Content of each subject in each year “] above.

2.16 Project work to be done if any

As stipulated by the HoD if necessary.

2.17 Any other requirements [CME, Paper Publishing etc.]

Not Applicable

2.18 Prescribed/recommended textbooks for each subject

As per [“Teaching learning methods “ and “Content of each subject in each year “] above.

2.19 Reference books

As per [“Teaching learning methods “ and “Content of each subject in each year “] above.

2.20 Journals:

As decided by the HoD.

2.21 Logbook :To be maintained for all academic work and shall be countersigned by the concerned HOD.

3. EXAMINATIONS

3.1 Eligibility to appear for exams [including Supplementary]

Each candidate should put in minimum 80% of attendance in theory and clinical practical separately for appearing university examination. There shall be three Sessional examinations, the final one in the University model and is mandatory to appear. The average of the highest two marks shall be taken as the internal assessment mark.

The candidate must secure a minimum of 50% marks for internal assessment in a particular subject in theory and practical separately, in order to be eligible to appear in the university examination of the subject.

Attendance and condonation

Each candidate should put in minimum 80% of attendance in theory and practical separately for each subject to appear in university examination. Condonation of 10% in the attendance once in the entire course period can be granted by the Head of the Institution in consultation with HOD and the same may be communicated to the university along with prescribed fee , and a declaration that the student has not availed the facility in the previous years. There shall be a register for recording the details of condonation granted to students which is subject to periodic verification by KUHS.

3.2 Schedule of Regular/Supplementary exams

There will be two examinations one regular and one supplementary in an academic year. The supplementary examinations shall be conducted within 6 months after declaration of results.

A student fails either in theory or practical shall appear for both theory and practical again.

3.3 Scheme of examination showing maximum marks and minimum marks

First year: -The subject English Language will be having two internal examinations.

1st Semester - 50 marks

2nd Semester – 50 marks

First year 1st semester – Internal Assessment only

Sl. No	Subject	Marks	
		Max.	Min.
1	English	50	25
2	Mathematics	40	20
3	Chemistry	40	20
4	Physics	10	-
5	General Anatomy	10	-
6	Ocular Anatomy	10	-
7	General Physiology	10	-
8	Ocular Physiology	10	-

First year 2nd semester – University Examination

Sl. No	Subject	IA Max	IA Min	University Theory Examination		Total	
				Max.	Min.	Max.	Min.
1	Anatomy Section – A – General Anatomy						

	Anatomy - Section – B – Ocular Anatomy	20	10	80	40	100	50
2	Physiology – Section – A – General Physiology	20	10	80	40	100	50
	Physiology - Section – B – Ocular Physiology						
3	Physical Optics & Geometrical Optics	20	10	80	40	100	50
Grand Total – First year						300	

Second Year [3rd Semester] Internal Assessment only

Sl. No	Subject	Marks Max.	Mark Min.
1	Information Technology	40	20
2	Nutrition and Biochemistry	10	-
3	Pharmacology	10	-
4	Microbiology	10	-
5	Pathology	10	-
6	Clinical Examination of visual system and instruments	10	-
7	Visual optics	10	-
8	Optometric optics	10	-
Total		110	-

Second Year [4th Semester] University Examination

Sl. No	Subject	IA Max	IA Min.	Uty.Theory Ex.		University Practical		IA Max	IA Min.	Total	
				Max.	Min					Max	min
1	Paper I – Section A – Nutrition & Biochemistry	20	10	80	40	No practical examination		-	-	100	50
	Paper – I – Section – B - Pharmacology					No practical examination		-	-		
Note : Examination of Paper I Section A and B can be conducted in separate days											
2	Paper II – Section A - Pathology	20	10	80	40	No practical examination		-	-	100	50
	Paper II – Section B - Microbiology					No practical examination		-	-		
3	Clinical Examination of visual systems and ophthalmic instruments	10	5	40	20	40	20	10	5	100	50
4	Visual Optics	10	5	40	20	40	20	10	5	100	50
5	Optometric Optics	10	5	40	20	40	20	10	5	100	50
Grand Total – Second year										500	

Final year – 5th Semester – Internal Assessment only

Sl. No	Subject	Marks Max	Min
1	General Medicine	10	5
2	Eye Diseases	10	-
3	Contact lens	10	-

4	Low Vision and Dispensing optics & mechanical optics	10	-
5	Squint and orthoptics	10	-
6	Community optometry	10	-
Total		50	-

Final Year [6th Semester] – University Examination

Sl. No	Subject	IA Max	IA Min.	Uty.Theory Ex.		University Practical Exam		IA Max	IA Min.	Total	
				Max.	Min	Max.	Min			Max.	Min
1	Eye Diseases	10	5	40	20	40	20	10	5	100	50
2	Contact lens	10	5	40	20	40	20	10	5	100	50
3	Low vision and Dispensing optics & Mechanical optics	10	5	40	20	40	20	10	5	100	50
4	Squint and orthoptics	10	5	40	20	40	20	10	5	100	50
5	Community Optometry	10	5	40	20	40	20	10	5	100	50
6	Project	Internal examination only								100	50
Grand Total – Third Year										600	

Pattern of Internal Assessment for subjects English, Mathematics, Basics in Applied Chemistry, Information Technology and General Medicine

Internal Examinations will be conducted at the respective institutions in the following pattern.

Sl. No	Subject	Semester	Max. Marks
1	English	1 & 2	50+50 = 100
2	Mathematics	1	40
3	Basics in Applied Chemistry	1	40
3	IT	3	40
4	General Medicine	5	10

* In order to register for the regular examination of KUHS in the 3rd year of the course [final year] all students need to pass all the papers of 1st & 2nd years of the course.

3.4 Papers in each year:

As given under "Teaching learning methods " and "Content of each subject in each year " above

3.5 Details of theory exams [include number of papers, Duration, Type of questions & number of questions and marks

As per clause 3.3

3.6 Model question paper for each subject with question paper pattern

Reg. No.:.....

First BSc OPTOMETRY EXAMINATION (Model Question Paper)

General Science

Time: 3 hrs

Maximum marks: 80

- Answer all questions
- Draw diagrams wherever necessary
- Write Section A and Section B in separate answer books. Do not mix up questions from Section A and Section B

QP Code:

Section A: Physics

Marks: 40

Essay

(10)

1. What is simple harmonic motion? Derive an expression for total energy of simple harmonic motion. Derive an expression for composition of simple harmonic motion in a straight line.

Short notes (5x3=15)

2. Sign convention used in geometric optics.
3. Define Coma and how it can be eliminated.
4. Explain the principle of holography

Answer briefly (2x5=10)

5. Characteristic properties of laser
6. State Malu's law
7. Explain the third order theory
8. Focal points
9. Explain Raman scattering

Fill in the blanks (1x5=5)

10. The velocity of IR is -----.
11. LASER originated as an acronym for -----.
12. SI unit of luminosity is -----.
13. Formation of colors in thin films is due to -----.
14. The lens in human body is a ----- lens.

QP Code: Section B: Chemistry Marks:40

Essay (10)

1. Discuss the shapes of methane, ethane, ethene and ethyne in terms of hybridisation

Short notes (5x3=15)

2. Describe the various methods for resolution of racemic mixtures
3. Thin layer chromatography.
4. Discuss the molecular structure of benzene

Answer briefly (2x5=10)



5. Explain the electrometric effect with example.
6. The preparation of sulphapyridine
7. Define the term elution and eluent
8. What are the biochemical functions of vitamin B12
9. Draw the optical isomers of lactic acid

Fill in the blanks (1x5=5)

10. Homolytic fission of a covalent bond leads to the formation of -----.
11. Glucose reacts with excess of phenyl hydrazine and forms -----.
12. Carbohydrate which is essential constituent of plant cells is -----.
13. ----- is a provitamin for vitamin A.
14. ----- is a carbohydrate found in blood.

Reg. No.:.....

First BSc OPTOMETRY EXAMINATION (Model Question Paper)

Anatomy

Time: 3 hrs

Maximum marks: 80

- Answer all questions
- Draw diagrams wherever necessary
- Write Section A and Section B in separate answer books. Do not mix up questions from Section A and Section B

QP Code: Section A: General anatomy

Marks:40

Essay (10)

1. Define cartilage. Mention the different types . Describe them with neat labeled diagrams.

Short notes (5x3=15)



2. Blood supply of heart.
3. Transitional epithelium
4. Synovial joint

Answer briefly
(2x5=10)

5. Connective tissue fibres
6. Anastomosis of blood vessels
7. Diagram of a typical neuron
8. Simple epithelia with example
9. Smooth muscle

Fill in the blanks
(1x5=5)

10. The gland with both exocrine and endocrine functions is -----.
11. The major constituent of tunica media of large arteries is -----.
12. The cell providing myelin sheath in the central nervous system is -----.
13. The tissue where intercalated disc is seen is -----.
14. The largest organ in the body is -----.

QP Code:

Section B: Ocular anatomy

Marks:40

Essay

(10)

1. Name the extraocular muscles. Describe the actions and nerve supply of each muscle.

Short notes

(5x3=15)

2. Angle of anterior chamber
3. Layers of cornea
4. Lacrimal apparatus

Answer briefly

(2x5=10)

5. Parts of conjunctiva
6. Sphincter pupillae
7. Structure of human lens
8. Draw and label the layers of retina
9. Ophthalmic artery

Fill in the blanks

(1x5=5)

10. The muscle which helps to open the upper lid is -----.
11. The normal depth of anterior chamber is -----.
12. Lens develops from -----.
13. Aqueous is secreted by -----.
14. The sebaceous gland related to tarsus is -----.

Revised (Model Question Paper)

QP Code:

Reg. No.:.....

FIRST BSc OPTOMETRY EXAMINATION

Section A: General Physiology

Time: 3 hrs

Maximum marks: 40

- *Answer all questions*
- *Draw diagrams wherever necessary*

Essay

(1x10=10)

1. Define Cardiac output? What is the normal value? Discuss the factors affecting cardiac output. Add a note on its regulation.

(2+1+3+4=10 marks)

Short notes



(3x5=15)

2. Intrinsic pathway of coagulation.
3. Surfactant.
4. Enterohepatic circulation

Answer briefly

(5x2=10)

5. Functions of platelets.
6. REM sleep
7. Dwarfism
8. Dead space
9. Juxtaglomerular Apparatus

One word answer

(5x1=5)

10. Normal value of Serum Calcium.....
11. Normal Arterial Oxygen Concentration
12. Normal Resting Membrane Potential in a Neuron
13. Normal Hemoglobin value in male
14. Cells which nourish the developing sperms

(Model Question Paper)

QP Code:

Reg. No.:.....

FIRST BSc OPTOMETRY EXAMINATION

Section B: Ocular Physiology

Time: 3hrs

Maximum marks: 40

- *Answer all questions*
- *Draw diagrams wherever necessary*

Essay (1x15=10)

- 1 a. Draw and label the Visual pathway.
- b. What is the normal intra ocular pressure?
- c. Briefly explain Glaucoma.

[4+2+4 = 10 marks]

Short notes (3x5=15)

2. Dark Adaptation

3. Reduced Eye of Listing
4. Homonymous hemianopia

Answer briefly (5x2=10)

5. Electro Retinogram
6. Indirect Light Reflex
7. Functions of Tears
8. Cataract
9. Rhodopsin

One word answer (5x1=5)

10. The Primary Visual area is
11. Refractive index of Cornea is..... [specify units]
12. Normal Intraocular Pressure is[specify units]
13. Expansion of 'LASER'
14. In Argyll Robertson Pupil,reflex is ABSENT.

QP Code:

Reg. No.:.....

SECOND BSc OPTOMETRY FINAL AVERAGE EXAMINATION (Model Question Paper)

Optometric Optics

Time: 2 hrs

Maximum marks: 40

Answer all questions

Draw diagrams wherever necessary

Essays

(1x10=10)

1. Define bifocal spectacle lenses. Describe the types of bifocals. Add a note on trifocals.

Short notes

(3x5=15)

2. Lens faults and types
3. The effective power of a thin lens
4. Abbevalue. Derive the equation $ChAb=P/V$

Answer briefly

(5x2=10)

5. Fresnel prism
6. Materials used for ophthalmic lenses

7. Spectacle magnifier
8. Field of view of ophthalmic lenses
9. Calculate the prismatic effect at NV point of prescription -3.00DC in RE and -5.00DC in LE, add is +3.00. The near optic centre is 8mm below and 2.5mm in, the segment top is 4mm below from distance optic centre.

One word answer

(5x1=5)

10. The size of abrasive using during polishing is-----.
11. Photo chromic filters contain microscopic crystals of -----.
12. Jack in the box phenomenon seen with the use of high convex lens is due to-----.
13. Fitting of lens into the frame is called-----.
14. Chemical name of CR-39 is -----.

QP Code:

Reg. No.:.....

SECOND BSc OPTOMETRY FINAL AVERAGE EXAMINATION (Model Question Paper)

Clinical Examination of Visual System and Ophthalmic Instruments

Time: 2 hrs

Maximum marks: 40

Answer all questions

Draw diagrams wherever necessary

Essays

(1x10=10)

1. Measurement of visual acuity in school children and adults. Briefly outline the principles of Snellen's test types.

Short notes

(3x5=15)

2. History taking of an ophthalmic case.
3. Examination of intra ocular pressure. Mention different methods.
4. Examination of lacrimal system.

Answer briefly

(5x2=10)

5. CC CARD
6. Slit lamp, adjustment and illuminations.
7. Colour vision testing devices.

8. Types of retinoscopes.
9. Examination of cornea

One word answer

(5x1=5)

10. RAF rule is used for
11. Prism bars are used for.....
12. Types of ophthalmoscopes.
13. Bjerrum's screen is used for.....
14. Definition of visual field.....

QP Code:

Reg. No.:.....

SECOND BSc OPTOMETRY FINAL AVERAGE EXAMINATION (Model Question Paper)

Visual optics

Time: 2 hrs

Maximum marks: 40

Answer all questions

Draw diagrams wherever necessary

Essays

(1x10=10)

1. Define retinoscopy. Describe the optics of the stages of retinoscopy in detail.

Short notes

(3x5=15)

2. Draw the schematic representation of reduced eye and mark the cardinal points.
Add a note on Gullstrand's indices.
3. Presbyopia
4. Knaps rule and its application.

Answer briefly

(5x2=10)

5. Far point
6. Do the toric transpositions of +3.50 DS / +2.00 D cyl x 180 (Base curve + 6.00 and - 6.00)
7. Acquired myopia
8. Principle of Bausch and Lomb keratometer.
9. Duo chrome test.



One word answer

(5x1=5)

10. The equation $R=1.22 \lambda / d$ representing Airy disc diameter is related to -----.
11. Straddling is used to refine -----.
12. Myopia more than ----- is referred to as pathological myopia
13. The Scheiner principle is used in -----.
14. The cycloplegic effect of atropine lasts for -----days.

Reg. No.:.....

SECOND BSc OPTOMETRY FINAL AVERAGE EXAMINATION (Model Question Paper)

Microbiology & Pathology

Time: 3 hrs

Maximum marks: 80

- Answer all questions
- Draw diagrams wherever necessary
- Write Section A and Section B in separate answer books. Do not mix up questions from Section A and Section B

QP Code:

Section A: Microbiology

Marks:40

Essay

(15)

2. Discuss the major antigens of HIV (diagram to be included) and the laboratory diagnosis of this virus

Short notes

(2x5=10)

2. Dimorphic fungi and dermatophytes
3. Coagulase test

Answer briefly

(6x2=12)

4. Methicillin resistant staphylococcus aureus
5. Gram negative bacilli
6. Moraxella catarrhalis

7. Pseudomonas aeruginosa
8. Pnuemococci
9. AFB staining

One word answer

(3x1=3)

10. Catalase negative gram positive cocci
11. Use of KOH mount
12. Drug of choice for gram positive organisms

QP Code:

Section B: Pathology

Marks:40

Essay

(15)

1. Define neoplasm. Enumerate the differences between benign and malignant neoplasms. Mention the common routes of metastasis. Name two malignant tumors of eye (2+6+5+2)

Short notes

(3x5=15)

2. Causes and laboratory findings of iron deficiency anemia
3. Ketone bodies in urine
4. WBC count

Answer briefly

(4x2=8)

5. Types of infarcts
6. Causes of thrombocytopenia
7. Fixation of tissues
8. Primary tuberculosis

One word answer

(2x1=2)

9. Two causes of haematuria
10. Two causes of neutrophilia

QP Code:

Reg. No.:.....

THIRD BSc OPTOMETRY FINAL AVERAGE EXAMINATION (Model Question Paper)

Eye diseases

Time: 2 hrs

Maximum marks: 40

Answer all questions

Draw diagrams wherever necessary

Essays

(1x10=10)

1. Define dacryocystitis. Classify dacryocystitis. Discuss anatomy of lacrimal apparatus. Describe the clinical features, investigations and management of chronic dacryocystitis.(3+3+4=10)

Short notes

(3x5=15)

2. Ptosis
3. Pterygium
4. Features of vitamin A deficiency

Answer briefly

(5x2=10)

5. Types of keratoplasty
6. Ophthalmia neonatorum
7. 4 complications of cataract surgery
8. Stages of primary narrow angle glaucoma

9. 4 causes of proptosis

One word answer

(5x1=5)

10. Adhesion of palpebral and bulbar conjunctiva is called -----.
11. Keratic precipitates are features of -----.
12. Collection of blood in anterior chamber is called -----.
13. Refractive status of aphakic eye is -----.
14. Surgical management of POAG is called -----.

QP Code:

Reg. No.:.....

THIRD BSc OPTOMETRY FINAL AVERAGE EXAMINATION (Model Question Paper)

Community optometry

Time: 2 hrs

Maximum marks: 40

Answer all questions

Draw diagrams wherever necessary

Essays

1. Define and classify biomedical waste. Discuss the waste management and mention its universal precaution. (2+2+3+3=10)

Short notes

(3x5=15)

2. Sterilization by heat
3. School eye screening programme
4. Consumer protection act

Answer briefly

(5x2=10)

5. Retinoblastoma
6. Human resource utilization rate
7. 4 causes of preventable blindness in a child
8. Problems with aphakic glass
9. 4 methods of prevention of occupational diseases

One word answer

(5x1=5)

10. Most common type of congenital cataract is -----.
11. A drug used for general anesthesia is -----.
12. Arithmetic mean is calculated by the formula -----.
13. Central ophthalmic cell of NPCB is headed by -----.
14. Xerophthalmia is due to deficiency of -----.

QP Code:

Reg. No.:.....

THIRD BSc OPTOMETRY FINAL AVERAGE EXAMINATION (Model Question Paper)

Contact lens, Low vision aids and dispensing

Time: 2 hrs

Maximum marks: 40

Answer all questions

Draw diagrams wherever necessary

Essays

1. Classify contact lens material. Discuss the physical properties and chemical composition of contact lens materials. Write a note on new generation materials.
(2+2+3+3=10)

Short notes

(3x5=15)

2. Hand magnifiers
3. Lens replacement schedules for soft contact lens
4. Strategies of visual rehabilitation among patients with peripheral field loss

Answer briefly

(5x2=10)

5. Base curve of a contact lens
6. Fitting triangle
7. Prosthetic contact lens
8. Notex
9. 4 indications for rigid gas permeable lens

One word answer

(5x1=5)

10. Vertex distance compensation is made in case of contact lens of power more than -----

11. Slumping is the method of manufacture of -----.
12. Legal blindness refers to best corrected visual acuity less than ---- in the better eye.
13. Ideal contact lens material for continuous wear is -----.
14. A tear prism height of less than ----- suggests dry eye.

QP Code:

Reg. No.:.....

THIRD BSc OPTOMETRY FINAL AVERAGE EXAMINATION (Model Question Paper)

Squint and BSV

Time: 2 hrs

Maximum marks: 40

Answer all questions

Draw diagrams wherever necessary

Essays

1. Name the extra ocular muscles. Discuss their origin, insertion, nerve supply and actions. Describe motor adaptation to an acute onset squint.
(2+5+3=10)

Short notes

(3x5=15)

2. Features of Restrictive squints
3. Abnormal retinal correspondence
4. TNO test

Answer briefly

(5x2=10)

5. Angle kappa
6. Forced duction test
7. Mobius syndrome
8. Uncrossed diplopia
9. Optokinetic nystagmus

One word answer

(5x1=5)

10. Crossed diplopia is seen in -----.
11. Normal AC/A ratio is -----.
12. The muscle affected in Brown's syndrome is -----.
13. Crowding phenomenon is a feature of -----.
14. Secondary deviation is more than primary deviation in -----.

3.7 Internal assessment component

Minimum three internal examinations shall be conducted in each subject during a year of which the final one is University model examination and is mandatory. The average marks of two best performances shall be taken into consideration for the award of internal

marks. Marks of evaluation by other methods like assignments, seminars, projects etc. can be added to the internal marks. **A candidate must obtain 50% of marks in internal assessment to be eligible to appear the university examination.** The class average of internal assessment marks the whole class should not exceed 75% of maximum marks for regular examination and 80% for supplementary examination. The candidates who have failed to obtain the minimum internal marks should be given another chance to improve their internal assessment mark only before the next scheduled university examination. The award shall be on the basis of the assessment made by the teachers from the candidate's performance in the assignments, class tests, Optical shop work, record work etc.

3.8 Details of practical examination

As mentioned in item "Papers in each year "

3.9 Number of examiners (Internal & External) and their qualifications

The teachers and examiners should possess qualifications acquired from a University / Institution recognized by KUHS. The teachers should possess post graduate degree from a university recognized by KUHS. To become external/internal examiner a teacher should possess a minimum of three years of post P.G teaching experience in the concerned subject. The following are the faculty qualifications for teaching and becoming and Examiner.

There shall be two examiners – One Internal and External. The External examiners shall be drawn from-another University where a similar course is being conducted.

3.10 Details of viva:

As per "Papers in each year "above

4 INTERNSHIP

4.1 Eligibility for internship

Students will be eligible to do internship only after passing all the theory papers and clinical practicum.

Provisional registration-After passing the final year exam before joining for internship all students have to take provisional registration from Kerala state Para medical council .

4.2 Details of internship Training

Duration: Every candidate admitted BSc optometry degree course shall undergo one year of compulsory rotating internship after passing of the final year examinations. No candidate shall be awarded degree certificate without successfully completing one year of internship.

Internship posting: As directed by the HOD.

Maintenance of records by students: Submission of internal works such as journal presentation, case presentation, seminars as per the institutional guidelines is mandatory.

Successful completion- the student must maintain a log book. On completion of each posting the same will have to be certified by the faculty in-charge of the posting for both attendance as well as work done. On completion of all postings, the duly completed log book will be submitted to the Principal / Head of the Institution/programme to be considered as having successfully completed the internship programme.

Extension of internship: Internship shall be extended by the number of days the students remains absent. These extended days of Internship should be completed in the respective external/internal Institution. Any other leave other than eligible leave has to be compensated by extension granted by Principal.

4.3 Model of Internship Mark lists

Internship completion certificate: Issued from the concerned Institution

4.4 Extension rules:

Any other leave other than eligible leave less than 6 months has to be compensated by extension granted by the Principal

Extension of internship: Internship shall be extended by the number of days the students remains absent. These extended days of Internship should be completed in the respective external/internal Institution. Any other leave other than eligible leave has to be compensated by extension granted by Principal. However the course shall be completed within double the duration of the course.

4.5 Details of Training given

Every candidate admitted BSc optometry degree course shall undergo one year of compulsory rotating internship after passing of the final year examinations. No candidate shall be awarded degree certificate without successfully completing one year of internship.

5. ANNEXURES

5.1 Check Lists for Monitoring: Log Book, Seminar Assessment etc. to be formulated by the curriculum committee of the concerned Institution

SYLLABUS

**for Courses affiliated to the
Kerala University of Health Sciences
Thrissur 680596**



**BACHELOR OF SCIENCE IN
PERFUSION TECHNOLOGY**

Course Code: 015

(2016-17 Academic year onwards)

2016

2. COURSE CONTENT

2.1 Title of the course

Bachelor of Science in Perfusion Technology

(BSc. Perfusion technology)

2.2 Objectives of the Course-

Perfusion Technology degree course is to provide a competent Cardiac Perfusionist who is well versed with modern technologies and up to date knowledge in patient care.

A **perfusionist**, also known as a **clinical perfusionist** or a **cardiovascular perfusionist**, is a specialized healthcare professional who uses the heart-lung machine during cardiac surgery and other surgeries that require cardiopulmonary bypass to manage the patient's physiological status. The perfusionist is a highly trained member of the cardiothoracic surgical team which consists of cardiac surgeons, anesthesiologists, physician assistants, surgical technologists, and nurses. The perfusionist is solely responsible for the management of the physiological and metabolic needs of the cardiac surgical patient so that the cardiac surgeon may operate on a still, unbeating heart. This is accomplished through the utilization of the heart-lung machine, oxygenator, filters, reservoirs and tubing. The perfusionist is responsible for the management of circulatory and respiratory functions of the patient so that the cardiac surgeon can focus on the actual surgical procedure. Other responsibilities include autologous blood collection and processing, implementation and management of the intra-aortic balloon pump, adult and infant extracorporeal membrane oxygenation (ECMO), monitoring of anticoagulation, electrolyte, acid-base balance and blood-gas composition, placing and managing patients on ventricular assist devices as bridge to recovery or heart transplantation and supporting patients receiving lung or liver transplants and in procurement of cardiothoracic donor organs for transplantation

Cardiovascular Perfusion Technology involves the study of physiology, pathology and associated equipment used to support and/or assume the function of the heart and/or lungs during medical procedures. The perfusion technologist prepares and operates the heart-lung machine and other sophisticated equipment as directed

by healthcare physicians. The perfusionist measures various blood and other parameters to identify appropriate mechanical, pharmacological and thermal manipulation to maintain tissue viability. To perform these tasks the perfusionist must have a thorough understanding of the both respiratory and circulatory systems and be able to operate complex equipment. Additionally the perfusionist must be capable of handling stressful situations, pay great attention to detail, communicate effectively, and be willing to stay abreast of new developments in the profession

This course is to provide a framework to guide safe and effective cardiopulmonary bypass (CPB). Clinical teams implement the content of this document when developing institution-specific protocols for patients undergoing cardiac surgery utilizing CPB.

A Perfusionist shall conduct cardiopulmonary bypass in compliance with departmental protocols. A patient-specific management plan for the cardiopulmonary bypass (CPB) procedure shall be prepared and communicated to the surgical team either during the pre- operative briefing or prior to beginning the procedure. The perfusionist should participate in the post-procedure debrief with the surgical team.

The mission of the KUHS is to encourage and foster the development of the profession of clinical perfusion through education and certification, so as to provide optimum patient care. A perfusionist shall recognize that the term “professional ethics” incorporates a commitment to service, to competent practice and to consistent development for the benefit of the community. This code shall guide the conduct of the perfusionist in all circumstances. Perfusionist who has successfully completed an accredited educational program and has successfully taken the examinations set by KUHS and BSc Perfusion Technology Degree will be awarded to them.

The **goals** of the Degree are diverse and include: -development of professional standards for perfusion - enhancement of perfusion scope of practice - development of continuing education programs on national and regional levels -

support of educational programs for entering perfusionists - scientific dissemination of knowledge

2.3 Medium of Instruction

The medium of instruction for the course shall be English.

2.4 Course outline

As given in curriculum

2.5 Duration

Duration shall be for a period of four years including one year internship training.

2.6 Subjects

As given curriculum

2.7 Total number of hours

The number of hours of teaching theory and practical subject wise in first year, second year and third year are shown in Table-I, Table-II and Table-III

Table - I Distribution of Teaching Hours in First Year Subjects

Main Subjects

SL NO	Subject	Theory No Of Hrs	Practical No Of Hrs	Total No. of Hours
1	Human Anatomy	70	20	90
2	Physiology	70	20	90
3	Biochemistry	70	20	90
4	Pathology-[Clinical pathology, Haematology & Blood –Banking]	70	20	90
5	Microbiology	70	20	90
	Total	350	100	450

The classes in main subjects are to be held from Monday to Thursday. On Fridays and Saturdays students shall work in hospitals in the respective specialty or department chosen by them

Clinical/Lab posting -470Hours- Fri day 9am - 1pm and 2pm - 4-30 pm

Saturday 9am - 1pm

Table - II Distribution of Teaching Hours in Second Year Subjects

Main Subjects-No of hrs

SL NO	Subject	Theory	Practical	Clinical Posting	Total Hours
1	Medicine relevant to	50	-	-	50
2	Section A Applied Pathology	30	30	-	60
3	Section B Applied Microbiology	30	30	-	60
4	Applied Pharmacology	50	-	-	50
5	Introduction to Perfusion Technology	80	100	650	830
	Total	240	160	65	1050

Table -III Distribution of Teaching Hours in Third Year Subjects

Main Subjects-No of hrs

S L No	Subjec	Theory	Practical	Clinical posting	Tota l
1	Perfusion Technology – Clinical	50	50	250	350

2	Perfusion Technology – Applied	50	50	25	350
3	Perfusion Technology –	50	50	25	350
	Total	150	150	750	1050

2.8 Branches if any with definition

Not applicable

2.9 Teaching Learning methods

- Lecture and practical classes
- During the internship year the candidates should do 5 months of internship in an external institute (approved by KUHS) and the remaining 5 months in the parent institute.

2.10 Content of each subject in each year

ANATOMY

No. of theory classes: 70 hours

No. of practical classes: 20 hours

1.Introduction: human body as a whole

Theory:

Definition of anatomy and its divisions

Terms of location, positions and planes

Cell and its organelles

Epithelium-definition, classification, describe with examples, function

Glands- classification, describe serous & mucous glands with examples

Basic tissues - classification with examples

Practical: Histology of types of epithelium

Histology of serous, mucous & mixed salivary gland

2.Locomotion and support

Theory:

Cartilage - types with example & histology

Bone - Classification, names of bone cells, parts of long bone, microscopy of compact bone,

Names of all bones, vertebral column, intervertebral disc, fontanelles of fetal skull

Joints - Classification of joints with examples, synovial joint (in detail for radiology)

Muscular system: Classification of muscular tissue & histology

Names of muscles of the body

Practical: Histology of the 3 types of cartilage

Demo of all bones showing parts, radiographs of normal bones & joints

Histology of compact bone (TS & LS)

Demonstration of all muscles of the body

Histology of skeletal (TS & LS), smooth & cardiac muscle

3. Cardiovascular system

Theory:

Heart-size, location, chambers, exterior & interior

Blood supply of heart

Systemic & pulmonary circulation

Branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery,

Superficial palmar arch, femoral artery, internal iliac artery

Peripheral pulse

Inferior venacava, portal vein, portosystemic anastomosis

Great saphenous vein

Dural venous sinuses

Lymphatic system- cisterna chyli & thoracic duct

Histology of lymphatic tissues

Names of regional lymphatics, axillary and inguinal lymph nodes in brief

Practical: Demonstration of heart and vessels in the body

12 Histology of large artery, medium sized artery & vein, large vein

Microscopic appearance of large artery, medium sized artery & vein,

Large vein pericardium

Histology of lymph node, spleen, tonsil & thymus

Normal chest radiograph showing heart shadows

Normal angiograms

4. Gastro-intestinal system

Theory:

Parts of GIT, Oral cavity (lip, tongue (with histology), tonsil, dentition, pharynx, salivary glands, Waldeyer's ring)

Oesophagus, stomach, small and large intestine, liver, gall bladder, pancreas

Radiographs of abdomen

5. Respiratory system

Parts of RS, nose, nasal cavity, larynx, trachea, lungs, bronchopulmonary segments

Histology of trachea, lung and pleura

Names of paranasal air sinuses

Practical: Demonstration of parts of respiratory system.

Normal radiographs of chest

Histology of lung and trachea

6. Peritoneum

Theory: Description in brief

Practical: Demonstration of reflections

7. Urinary system

Kidney, ureter, urinary bladder, male and female urethra

Histology of kidney, ureter and urinary bladder

Practical: Demonstration of parts of urinary system

Histology of kidney, ureter, urinary bladder

Radiographs of abdomen-IVP, retrograde cystogram

8. Reproductive system

Theory:

Parts of male reproductive system, testis, vas deferens, epididymis, prostate (gross & histology) Parts of female reproductive system, uterus, fallopian tubes, ovary (gross & histology) Mammary gland - gross

Practical: Demonstration of section of male and female pelvis with organs in situ

Histology of testis, vas deferens, epididymis, prostate, uterus,
Fallopian tubes, ovary

Radiographs of pelvis - hysterosalpingogram

9. Endocrine glands

Theory:

Names of all endocrine glands in detail on pituitary gland, thyroid gland, parathyroid gland,

Suprarenal gland - (gross & histology)

Practical: Demonstration of the glands

13 Histology of pituitary, thyroid, parathyroid, suprarenal glands

10. Nervous system

Theory:

Neurons, Classification of NS

Cerebrum, cerebellum, midbrain, pons, medulla oblongata, spinal cord with spinal nerve (gross & histology) Meninges, Ventricles & cerebrospinal fluid, Names of basal nuclei, Blood supply of brain, Cranial nerves. Sympathetic trunk & names of parasympathetic ganglia

Practical: Histology of peripheral nerve & optic nerve

Demonstration of all plexuses and nerves in the body

Demonstration of all part of brain

Histology of cerebrum, cerebellum, spinal cord

11. Sensory organs:

Theory:

Skin: Skin-histology, Appendages of skin

Eye: parts of eye & lacrimal apparatus, Extra-ocular muscles & nerve supply

Ear: parts of ear- external, middle and inner ear and contents

Practical: Histology of thin and thick skin

Demonstration and histology of eyeball

Histology of cornea & retina

12. Embryology

Theory:

Spermatogenesis & oogenesis

Ovulation, fertilization

Fetal circulation

Placenta

Theory

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	2	2 x 10	20
Short Essay (SE)	6	6 x 5	30
Short Answer (SA)	10	10 x 3	30
Total Marks			80

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Anatomy shall be as given under

NO PRACTICAL EXAMINATION

REFERENCE BOOKS

Anatomy

1. William Davis (P) understanding Human Anatomy and Physiology MC Graw Hill
2. Chaurasia -A Text book of Anatomy
- T.S. Ranganathan - A text book of Human Anatomy
3. Fattana, Human anatomy (Description and applied) Saunder's & C P Prism Publishers, Bangalore - 1991
4. ESTER. M. Grishcimer, Physiology & Anatomy with Practical Considerations, J.P. Lippin Cott. Philadelphia
5. Essential of Human embryology, Bhatnagar revised edition, Orient Longman PVT Ltd.

PHYSIOLOGY

Theory 70 hours

Practical 20hours

1.Introduction - composition and function of blood

Red blood cells - Erythropoiesis, stages of differentiation function, count physiological Variation.

Haemoglobin -structure, functions, concentration physiological variation

Methods of Estimation of Hb

White blood cells - Production, function, life span, count, differential count

Platelets - Origin, normal count, morphology functions.

Plasma Proteins - Production, concentration, types, albumin, globulin, Fibrinogen, Prothrombin, Functions.

Haemostasis & Blood coagulation

Haemostasis - Definition, normal haemostasis, clotting factors, mechanism of clotting, disorders of clotting factors.

2. Blood Bank

Blood groups - ABO system, Rh system, Blood grouping & typing, Crossmatching

Rh system - Rh factor, Rh in compatibility.

Blood transfusion - Indication, universal donor and recipient concept, Selection criteria of a blood donor. Transfusion reactions Anticoagulants - Classification, examples and uses

3. Anaemias: Classification - morphological and etiological. Effects of anemia on body

Blood indices - Colour index, MCH, MCV, MCHC

Erythrocyte sedimentation Rate (ESR) and Packed cell volume, Normal values, Definition. Determination,

4. Blood Volume - Normal value, determination of blood volume and its regulation

Body fluid - pH, normal value, regulation and variation

Lymph - lymphoid tissue formation, circulation, composition and function of lymph

5. Cardiovascular system

Heart - Physiological Anatomy, Nerve supply

Properties of Cardiac muscle, Cardiac cycle-systole, diastole. Intraventricular pressure curves. Cardiac Output - only definition

Heart sounds- Normal heart sounds Areas of auscultation.

Blood Pressure - Definition, normal value, clinical measurement of blood pressure.

Physiological variations, regulation of heart rate, cardiac shock, hypotension, hypertension.

Pulse - Jugular, radial pulse, Triple response

Heart sounds - Normal heart sounds, cause characteristics and significance. Heart rate

Electrocardiogram - (ECG) -significance.

6. Digestive System - Physiological anatomy of Gastro intestinal tract and its functions

Salivary glands-Structure and functions. Deglutination -stages and regulation

Stomach - structure and functions

Gastric secretion - Composition function regulation of gastric juice secretion

Pancreas - structure, function, composition, regulation of pancreatic juice

7.Liver - functions of liver, Bile secretion, composition, function regulation of bile secretion .Bilirubin metabolism types of bilirubin, Vandernberg reaction, Jaundice- types, and significance.

Gall bladder - functions

Intestine - small intestine and large intestine

Small intestine -Functions- Digestive, absorption, movements.

Large intestine - Functions, Digestion and absorption of Carbohydrates, Proteins, Fats, Lipids.Defecation

8.Respiratory system-Functions of Respiratory system, Physiological Anatomy of Respiratory system, Respiratory tract,Respiratory Muscles, Respiratory organ-lungs, Alveoli, Respiratory membrane, stages of respiration.Mechanism of normal and rigorous respiration. Forces opposing and favouring expansion of the lungs. Intra pulmonary pleural pressure, surface tension, recoil tendency of the wall. Transportation of Respiratory gases: Transportation of Oxygen: Direction, pressure gradient, Forms of transportation, Oxygenation of Hb. Quantity of Oxygen transported.

9.Lung volumes and capacities

Regulation of respiration what? Why? How? Mechanisms of Regulation, nervous and chemical regulation. Respiratory centre. Hering Breuer Reflexes.

Applied Physiology and Respiration: Hypoxia, Cyanosis, Asphyxia, Dyspnea, Dysbarism, Artificial Respiration, Apnoea.

10.Endocrine System - Definition Classification of Endocrine glands & their Hormones Properties of Hormones.

Thyroid gland hormone - Physiological, Anatomy, Hormone secreted, Physiological function, regulation of secretion. Disorders - hypo and hyper secretion of hormone

Adrenal gland, Adrenal cortex physiologic anatomy of adrenal gland, Adrenal cortex, cortical hormones - functions and regulation

Adrenal medulla - Hormones, regulation and secretion.

Functions of Adrenaline and nor adrenaline

Pituitary hormones - Anterior and posterior pituitary hormones, secretion, function

Pancreas - Hormones of pancreas

Insulin - secretion, regulation, function and action

Diabetes mellitus - Regulation of blood glucose level

Parathyroid gland - function, action, regulation of secretion of parathyroid hormone.

Calcitonin - function and action

11.Special senses

Vision - structure of eye. Function of different parts. Structure of retina

Hearing structure and function of can mechanism of hearing

Taste - Taste buds functions. Smell physiology, Receptors.

12. Nervous system

Functions of Nervous system, Neurone structure, classification and properties. Neuroglia, nerve fiber, classification, conduction of impulses continuous and saltatory. Velocity of impulse transmission and factors affecting. Synapse - structure, types, properties.

Receptors - Definition, classification, properties. Reflex action - unconditioned properties of reflex action. Babinski's sign. Spinal cord nerve tracts. Ascending tracts, Descending tracts - pyramidal tracts - Extrapyramidal tracts. Functions of Medulla, pons, hypothalamic disorders.

Cerebral cortex lobes and functions, Sensory cortex, Motor cortex, Cerebellum functions of Cerebellum. Basal ganglion - functions. EEG.

Cerebro Spinal Fluid (CSF): formation, circulation, properties, composition and functions lumbar puncture.

Autonomic Nervous System: Sympathetic and parasympathetic distribution and functions and comparison of functions.

13 Excretory System, Excretory organs

Kidneys: Functions of kidneys structural and functional unit nephron, vasarecta, cortical and Juxtamedullary nephrons - Comparison, Juxta Glomerular Apparatus - Structure and function. Renal circulation peculiarities.

Mechanism of Urine formation: Ultrafiltration criteria for filtration GFR, Plasma fraction, EFP, factors effecting EFR. Determination of GFR selective reabsorption - sites of reabsorption substance reabsorbed, mechanisms of reabsorption Glucose, and urea.

H + Cl aminoacids etc. TMG, Tubular load, renal threshold % of reabsorption of different Substances, selective e secretion.

Properties and composition of normal urine, urine output. Abnormal constituents in urine,

Mechanism of urine concentration. Counter - Current Mechanisms: Micturition, Innervation of Bladder, Cystourethrogram.

Diuretics: Water, Diuretics, osmotic diuretics, artificial kidney renal function tests – plasma clearance Actions of ADH, Aldosterone and PTH on kidneys. Renal function tests

14 Reproductive system

Function of Reproductive system, Puberty, male reproductive system. Functions of testes, Spermatogenesis site, stages, factors influencing semen. Endocrine functions of testes Androgens - Testosterone structure and functions. Female reproductive system. Ovulation, Menstrual cycle. Physiological changes during pregnancy, pregnancy test. Lactation: Composition of milk factors controlling lactation.

15 Muscle nerve physiology

Classification of muscle, structure of skeletal muscle, Sarcomere contractile proteins, Neuromuscular junction. Transmission across, neuromuscular junction. Excitation contraction coupling. Mechanism of muscle contraction muscle tone, fatigue Rigour mortis

16 Skin -structure and function

Body temperature measurement, Physiological variation, Regulation of body Temperature by physical chemical and nervous mechanisms .Role of Hypothalamus, Hypothermia and fever.

Practicals

Haemoglobinometry

White Blood Cell count

Red Blood Cell count

Determination of Blood Groups

Leishman's staining and Differential WBC count

Determination of packed cell Volume

Erythrocyte sedimentation rate [ESR]

Calculation of Blood indices

Determination of Clotting Time, Bleeding Time

Blood pressure Recording

Auscultation for Heart Sounds

Artificial Respiration

Determination of vital capacity

Internal Assessment

Theory - Average of two exams conducted. 20

Practicals: Record & Lab work* 10

* There shall be no University Practical Examination and internal assessment marks secured in Practical need not be sent to the University.

Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Physiology shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	6	6 x 5	30
SHORT ANSWER (SA)	10	10 x 3	30
TOTAL MARKS			80

NO PRACTICAL EXAMINATION

REFERENCE BOOKS

Physiology

1. Guyton (Arthur) Text Book of Physiology.
Latest Ed. Prism publishers
2. Chatterjee (CC) Human Physiology Latest Ed.
Vol-1, Medical Allied Agency
3. Choudhari (Sujith K) Concise Medical Physiology Latest Ed. New Central Book,
4. Ganong

BIOCHEMISTRY

1. Carbohydrates

- Classification and reactions of carbohydrates
- Metabolism of carbohydrate
- Glycolysis, Gluconeogenesis,
- Significance of HMP shunt pathway,
- Glycogen metabolism, regulation of blood glucose
- Diabetes mellitus –classification, metabolic derangement, complication and monitoring

2. Lipids

- Classification of lipids, Biomembrane, importance of PUFA
- Metabolism of lipids
- Oxidation of fatty acids, synthesis of fatty acids, cholesterol, lipoproteins, dyslipidemias

3. Proteins.

- Structure of protein with examples, Classification of amino acids
- Compounds formed from amino acids,
- inborn errors of metabolism of amino acids

4. Enzymes.

- Classification, Kinetics, enzyme inhibition, regulation of enzyme action, clinical enzymology

5. Acid base balance.

- Regulation of normal blood pH, derangements in acid base status, compensatory mechanisms, anion-gap, arterial blood gas analysis.

6. Water and Electrolyte balance

7. Hemoglobin.Synthesis of heme, porphyria, degradation of heme, Jaundice.

8. LFT, RFT

9. Vitamins.-Fat soluble vitamins, water soluble vitamins

10. Minerals.Calcium and Iron in detail, selenium, copper, zinc, Phosphorus

PRACTICALS

1. Analysis of Normal Urine
2. Composition of urine
3. Procedure for routine screening
4. Urinary screening for inborn errors of metabolism
5. Common renal disease
6. Urinary calculus
7. Urine examination for detection of abnormal constituents
8. Interpretation and Diagnosis through charts
9. Liver Function tests
10. Lipid Profile
11. Renal Function test
12. Cardiac markers
13. Blood gas and Electrolytes
14. Estimation of Blood sugar, Blood Urea and electrolytes
15. Demonstration of Strips
16. Demonstration of Glucometer

Internal Assessment

Theory - Average of two exams conducted. 20 marks

Practicals: Record & Lab work* 10 marks

* There shall be no University Practical Examination and internal assessment marks secured in Practicals need not be sent to the University.

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Biochemistry shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	6	6 x 5	30
SHORT ANSWER (SA)	10	10 x 3	30
TOTAL MARKS			80

NO PRACTICAL EXAMINATION

REFERENCE BOOKS

Biochemistry

1. Varley - Clinical chemistry
2. TEITZ - Clinical chemistry
3. Kaplan - Clinical chemistry
4. Ramakrishna(S) Prasanna (KG), Rajna ® Text book of Medical Biochemistry Latest Ed
Orient longman Bombay -1980
5. Vasudevan (DM) Sreekumari(S) Text book of Biochemistry for Medical students, Latest
Edition
6. DAS (Debajyothi) Biochemistry Latest ED Academic, Publishers, Culcutta - 1992
7. Text Book of Medical Biochemistry - 3rd Edition, Orient Longman PVT Ltd
8. Practical Biochemistry for Medical Students - Rajagopal, Orient Longman PVT Ltd

PATHOLOGY

Histo Pathology, Clinical Pathology, Haematology and Blood Banking

Theory - 70 hours

Practical - 20 hours

HistoPathology - Theory

- Introduction to Histo Pathology
- Receiving of Specimen in the laboratory
- Grossing Techniques
- Mounting Techniques - various Mountants
- Maintenance of records and filing of the slides.
- Use & care of Microscope
- Various Fixatives, Mode of action, Preparation and Indication.
- Bio-Medical waste management
- Section Cutting

- Tissue processing for routine paraffin sections
- Decalcification of Tissues.
- Staining of tissues - H& E Staining
- Bio-Medical waste management

Clinical Pathology - Theory

- Introduction to Clinical Pathology
- Collection, Transport, Preservation, and Processing of various clinical specimens
- Urine Examination - Collection and Preservation of urine.

Physical, chemical, Microscopic Examination

- Examination of body fluids.
- Examination of cerebro spinal fluid (CSF)
- Sputum Examination.
- Examination of feces

Haematology - Theory

- Introduction to Haematology
- Normal constituents of Blood, their structure and function.
- Collection of Blood samples
- Various Anticoagulants used in Haematology
- Various instruments and glassware used in Haematology, Preparation and use of glassware
- Laboratory safety guidelines
- SI units and conventional units in Hospital Laboratory
- Hb, PCV
- ESR
- Normal Haemostasis
- Bleeding Time, Clotting Time, Prothrombin Time, Activated Partial Thromboplastin Time.
- Blood Bank-Introduction-Blood grouping and Rh Types-Cross matching

PRACTICALS

- Urine Examination.
- Physical, Chemical, Microscopy
- Blood Grouping Rh typing.
- Hb Estimation, PCV, ESR, Bleeding Time, Clotting Time.

- Histopathology - Section cutting and H &E Staining.

Internal Assessment

Theory - Average of two exams conducted. 20

Practicals: Record & Lab work* 10

* There shall be no University Practical Examination and internal assessment marks secured in Practical need not be sent to the University

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Pathology shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	6	6 x 5	30
SHORT ANSWER (SA)	10	10 x 3	30
TOTAL MARKS			80

NO PRACTICAL EXAMINATION

REFERENCE BOOKS

Pathology

1. Culling Histopathology techniques
2. Bancroft Histopathology techniques
3. Koss - cytology
4. Winifred greg - Diagnostic cytopathology
5. Orell - Cyto Pathology
6. Todd & Sanford Clinical Diagnosis by laboratory method
7. Dacie & Lewis - Practical Haematology
8. Ramanic Sood, Laboratory Technology (Methods and interpretation) 4th Ed. J.P. Bros, New Delhi -1996)

9. Satish Gupta Short text book of Medical Laboratory for technician J.P. Bros, New Delhi - 1998
10. Sachdev K.N. Clinical Pathology and Bacteriology 8th Ed, J.P. Bros, New Delhi-1991.
11. Krishna - Text book of Pathology, Orient Longman PVT Ltd. Bacteriology 8th Ed, J.P. Bros, New Delhi-

MICROBIOLOGY

Objective: - This course introduces the principles of Microbiology with emphasis on applied aspects of Microbiology of infectious diseases particularly in the following areas

- Principles & practice of sterilization methods.
- Collection and despatch of specimens for routine microbiological investigations. Interpretation of commonly done bacteriological and serological investigations.
- Control of Hospital infections
- Biomedical waste management
- Immunization schedule

Theory - 70 hours

1. Morphology 4 hours

Classification of microorganisms, size, shape and structure of bacteria. Use of microscope in the study of bacteria.

2. Growth and nutrition 4 hours

Nutrition, growth and multiplications of bacteria, use of culture media in diagnostic bacteriology.

3. Sterilisation and Disinfection 4 hours

Principles and use of equipments of sterilization namely Hot Air oven, Autoclave and serum inspissator. Pasteurization, Anti septic and disinfectants.

Antimicrobial sensitivity test

4. Immunology 6 hours

Immunity Vaccines, Types of Vaccine and immunization schedule Principles and interpretation of commonly done serological tests namely Widal, VDRL, ASLO, CRP, RF & ELISA. Rapid tests for HIV and HbsAg (Technical details to be avoided)

5. Systematic Bacteriology 20 hours

Morphology, cultivation, diseases caused, laboratory diagnosis including specimen collection of the following bacteria (the classification, antigenic structure and pathogenicity are not to be taught) Staphylococci, Streptococci, Pneumococci, Gonococci, Meningococci, C diphtheriae, Mycobacteria, Clostridia, Bacillus, Shigella, Salmonella, Esch coli, Klebsiella, Proteus, vibrio cholerae, Pseudomonas & Spirochetes

6. Parasitology 10 hours

Morphology, life cycle, laboratory diagnosis of following parasites E. histolytica, Plasmodium, Tape worms, Intestinal nematodes

7. Mycology 4 hours

Morphology, diseases caused and lab diagnosis of following fungi. Candida, Cryptococcus, Dermatophytes, opportunistic fungi.

8. Virology 10 hours

General properties of viruses, diseases caused, lab diagnosis and prevention of following viruses, Herpes, Hepatitis, HIV, Rabies and Poliomyelitis.

9. Hospital infection Causative agents, transmission methods, investigation, prevention and control of Hospital infection. 4 hours

10. Principles and practice Biomedical waste management 4 hours

Practical 20 hours

Compound Microscope.

Demonstration and sterilization of equipments - Hot Air oven, Autoclave, Bacterial filters.

Demonstration of commonly used culture media, Nutrient broth, Nutrient agar, Blood agar, Chocolate agar, Mac conkey medium, LJ media, Robertson Cooked meat media, Potassium Tellurite media with growth, Mac with LF & NLF, NA with staph Antibiotic susceptibility test
Demonstration of common serological tests - Widal, VRDL, ELISA.

Grams stain

Acid fast staining

Stool exam for Helminthic ova

Visit to hospital for demonstration of biomedical waste management.

Anaerobic culture methods.

Internal Assessment

Theory - Average of two exams conducted. 20

Practicals: Record & Lab work* 10

* There shall be no University Practical Examination and internal assessment marks secured in Practical need not be sent to the University.

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Microbiology shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	6	6 x 5	30
SHORT ANSWER (SA)	10	10 x 3	30
TOTAL MARKS			80

NO PRACTICAL EXAMINATION

REFERENCE BOOKS

Microbiology

1. Anathanarayana & Panikar Medical Microbiology
2. Roberty Cruckshank - Medical Microbiology - The Practice of Medical Microbiology
3. Chatterjee - Parasitology - Interpretation to Clinical medicine.
4. Rippon - Medical Mycology
5. Emmons - Medical mycology

6. Basic laboratory methods in Parasitology, 1st Ed, J P Bros, New Delhi - 199
7. Basic laboratory procedures in clinical bacteriology, 1st Ed, J P Brothers, New Delhi.

II YEAR BSc DEGREE PERFUSION TECHNOLOGY SYLLABUS

APPLIED PHARMACOLOGY

- General concepts about pharmacodynamic and Pharmacokinetic Principles involved in drug activity.

I. Autonomic nerves system.

- Anatomy & functional organisation.
- List of drugs acting on ANS including dose, route of administration, indications, contra indications and adverse effects.

II. Cardiovascular drugs- Enumerate the mode of action, side effects and therapeutic uses of the following drugs.

a. Antihypertensives

- Beta Adrenergic antagonists
- Alpha Adrenergic antagonists
- Peripheral Vasodilators
- Calcium channel blockers

b. Antiarrhythmic drugs

c. Cardiac glycosides

d. Sympathetic and nonsympathetic inotropic agents.

e. Coronary vasodilators.

f. Antianginal and anti failure agents

g. Lipid lowering & anti atherosclerotic drugs.

h. Drugs used in Haemostasis - anticoagulants Thrombolytics and antithrombolytics.

i. Cardioplegic drugs- History, Principles and types of cardioplegia.

j. Primary solutions - History, principles & types.

k. Drugs used in the treatment of shock.

III. Anaesthetic agents.

- Definition of general and local anaesthetics.
- Classification of general anaesthetics.
- Pharmacokinetics and Pharmacodynamics of inhaled anaesthetic agents.
- Intravenous general anaesthetic agents.
- Local anaesthetics - classification mechanism of action, duration of action and methods to prolong the duration of action. Preparation, dose and routes of administration.

IV. Analgesics

- Definition and classification
- Routes of administration, dose, frequency of administration, Side effects and management of non opioid and opioid analgesics

V. Antihistamines and antiemetics-• Classification, Mechanism of action, adverse effects, Preparations, dose and routes and administration.

VI. CNS stimulants and depressants

- Alcohol
- Sedatives, hypnotics and narcotics
- CNS stimulants
- Neuromuscular blocking agents and muscle relaxants.

VII. Pharmacological protection of organs during CPB

VIII. Inhalational gases and emergency drugs.

IX. Pharmacotherapy of respiratory disorders

- Introduction - Modulators of bronchial smooth muscle tone and pulmonary vascular smooth muscle tone
- Pharmacotherapy of bronchial asthma
- Pharmacotherapy of cough
- Mucokinetic and mucolytic agents
- Use of bland aerosols in respiratory care.

X. Corticosteroids - Classification, mechanism of action, adverse effects and complications. Preparation, dose and routes of administration.

XI. Diuretics

- Renal physiology
- Side of action of diuretics
- Adverse effects

- Preparations, dose and routes of administration.

XII. Chemotherapy of infections

- Definition
- Classification and mechanism of action of antimicrobial agents
- Combination of antimicrobial agents
- Chemoprophylaxis.
- Classification, spectrum of activity, dose, routes of administration and adverse effects of penicillin, cephalosporins, aminoglycosides, tetracyclines, chloramphenicol, antitubercular drugs.

XIII. Miscellaneous.

- IV fluids- various preparations and their usage.
- Electrolyte supplements
- Immunosuppressive agents
- New drugs included in perfusion technology.
- Drugs used in metabolic and electrolyte imbalance.

PRACTICALS:

1. Preparation and prescription of drugs of relevance.
2. Experimental pharmacology directed to show the effects of commonly used drugs of relevance and Interpretation of few charts.

Scheme of Examination

Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for applied Pharmacology shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	6	6 x 5	30
SHORT ANSWER (SA)	10	10 x 3	30
TOTAL MARKS			80

NO PRACTICAL EXAMINATION

Recommended Books.

1. R. S. Satoskar, S.D. Bhandarkar, S. S. Ainapure, Pharmacology and Pharmacotherapeutics, 18th Edition, single Volume, M/S Popular Prakashan, 350, Madan Mohan Marg, Tardeo, Bombay - 400 034.
2. K.D. Tripathi, Essentials of Medical Pharmacology, V. Edition, M/s. Jaypee Brothers
3. Laurence and Bennet, Clinical Pharmacology, ELBS Edition, 9th Edition.

APPLIED PATHOLOGY

I. CARDIOVASCULAR SYSTEM

- Atherosclerosis- Definition, risk factors, briefly Pathogenesis & morphology, clinical significance and prevention.
- Hypertension- Definition, types and briefly Pathogenesis and effects of Hypertension
- Aneurysms - Definition, classification, Pathology and complications.
- Pathophysiology of Heart failure
- Cardiac hypertrophy - causes, Pathophysiology & Progression to Heart Failure
- Ischaemic heart diseases- Definition, Types. Briefly Pathophysiology, Pathology & Complications of IHD
- Valvular Heart diseases- causes, Pathology & complication. Complications of artificial Heart valves.
- Cardiomyopathy - Definition, Types, causes and significance
- Pericardial effusion- causes, effects and diagnosis
- Congenital heart diseases - Basic defect and effects of important types of congenital heart diseases.

II. HAEMATOLOGY

- Anaemia - Definition, morphological types and diagnosis of anaemia. Brief concept about Haemolytic anaemia and polycythaemia.
- Leukocyte disorders- Briefly leukaemia, leukocytosis, agranulocytosis etc.

- Bleeding disorders- Definition, classification, causes & effects of important types of bleeding disorders. Briefly various laboratory tests used to diagnose bleeding disorders.

III. RESPIRATORY SYSTEM

- Chronic obstructive airway diseases - Definition and types. Briefly causes, Pathology and complications of each type of COPD.
- Briefly concept about obstructive versus restrictive pulmonary disease.
- Pneumoconiosis- Definition, types, Pathology and effects in brief.
- Pulmonary congestion and edema.
- Pleural effusion - causes, effects and diagnosis.

IV. RENAL SYSTEM

- Clinical manifestations of renal diseases. Briefly causes, mechanism, effects and lab diagnosis of ARF & CRS. Briefly Glomerulonephritis and Pyelonephritis.
- End stage renal disease - Definition, causes, effects and role of dialysis and renal transplantation in its management.
- Brief concept about obstructive uropathy.

PRACTICALS

1. Description & diagnosis of the following gross specimens.
 - a. Atherosclerosis-
 - b. Aortic aneurysm.-
 - c. Myocardial infraction.-
 - d. Emphysema-
 - e. Chronic glomerulonephritis.
 - f. Chronic pyelonephritis.
2. Interpretation & diagnosis of the following charts.
 - a. hematology Chart - AML, CML, Hemophilia, neutrophilia, eosinophilia.-
 - b. Urine Chart - ARF, CRF, AGN
3. Estimation of Hemoglobin.
4. Estimation Bleeding & Clotting time.

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 50 marks. Distribution of type of questions and marks for Applied Pathology shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	3	3 x 5	15
SHORT ANSWER (SA)	5	5 x 2	15
TOTAL MARKS			50

PRACTICAL EXAMINATION 40 Marks.

There will be a Combined Practical examination for Applied Pathology & Applied Microbiology.

Sl. No.	Tests	Marks
01	Interpretation of Hematology Chart	05
02	Interpretation of Urine Chart	05
03	Estimation of Hemoglobin	05
04	Estimation of Bleeding time & Clotting time	05
	Total	20

APPLIED MICROBIOLOGY

THEORY - 40 HOURS

1. Health care associated infections and Antimicrobial resistance: Infections that patients acquire during the course of receiving treatment for other conditions within a healthcare setting like Methicillin Resistant Staphylococcus aureus infections, Infections caused by Clostridium difficile, Vancomycin resistant enterococci etc. Catheter related blood stream infections, Ventilator associated pneumonia, Catheter Related urinary tract infections, Surveillance of emerging resistance and changing flora. The impact and cost attributed to Hospital Associated infection. **6 Hours**

2. Disease communicable to Healthcare workers in hospital set up and its preventive measure: Occupationally acquired infections in healthcare professionals by respiratory route (tuberculosis, varicella-zoster, respiratory syncytial virus etc), blood borne transmission (HIV, Hepatitis B, C, Cytomegalovirus, Ebola virus etc), oro faecal route (Salmonella, Hepatitis A

etc), direct contact (Herpes Simplex Virus etc). Preventive measures to combat the spread of these infections by monitoring and control. **6 Hours**

3. Microbiological surveillance and sampling: Required to determine the frequency of potential bacterial pathogens including *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis* and also to assess the antimicrobial resistance. Sampling: rinse technique, direct surface agar plating technique.

6 Hours

4. Importance of sterilization:

a. Disinfection of instruments used in patient care: Classification, different methods, advantages and disadvantages of the various methods.

b. Disinfection of the patient care unit

c. Infection control measures for ICU's

10 Hours

5. Sterilization:

- a. Rooms: Gaseous sterilization, one atmosphere uniform glow discharge plasma (OAUGDP).
- b. Equipments: classification of the instruments and appropriate methods of sterilization.
- c. Central supply department: the four areas and the floor plan for instrument cleaning, high-level disinfecting and sterilizing areas.

8 Hours

- 6. Preparation of materials for autoclaving:** Packing of different types of materials, loading, holding time and unloading.

4 Hours

PRACTICALS- 30 HOURS

- 1. Principles of autoclaving & quality control of Sterilization.
- 2. Collection of specimen from outpatient units, inpatient units, minor operation theater and major operation theater for sterility testing.
- 3. The various methods employed for sterility testing.
- 4. Interpretation of results of sterility testing.
- 5. Disinfection of wards, OT and Laboratory.

Scheme of Examination

Theory

There shall be one theory paper of three hours duration carrying 50 marks. Distribution of type of questions and marks for Applied Microbiology shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	4	4 x 5	20
SHORT ANSWER (SA)	5	5 x 2	10
TOTAL MARKS			50

PRACTICAL EXAMINATION 40 Marks

There will be a Combined Practical examination for Applied Pathology & Applied Microbiology.

No.	Tests	Marks
01	Dry heat / Moist heat: Temperature recording-charts interpretation	05
02	Dry heat / Moist heat: Colour change-indicators interpretation	05
03	Air sampling culture plates interpretation of Colony forming units based on air flow rate and sampling time	05
04	Interpretation of Sterility of Haemodialysis water/Distilled water /Deionised water based on growth of colonies in BHI agar to be reported as X CFU/mL	05
	Total	20

INTRODUCTION TO PERFUSION TECHNOLOGY

Basics of diagnostic techniques:

- Chest of X-ray-ECG-Echo-Angiography
- Nuclear Cardiology
- Laboratory investigations in relation to perfusion technology
- **Cardiopulmonary bypass and perfusion technology**
- **History of Cardiac surgery and perfusion**-Specific reference of Gibbon Lillehei, carrel
- Pre CPB surgery
- Azygous Flow principle.
- Hypothermic/nonhypothermic non-CPB surgery including gross's Well technique and controlled cross circulation.

Monitoring and instrumentation

- Concepts of monitoring - instrumentation technology of ECG machine, pressure transducer, syringe and peristaltic pumps, monitors, ventilators, pulse oximeters, temperature probes and thermo regulatory monitoring, defibrillators and fibrillators. Piped

and non-piped gas delivery systems and connections. Basic physics related to medically used gases.

- Haemodynamic monitoring
- Haemostatic monitoring
- Haematologic monitoring
- Maintenance of oxygen, carbon dioxide and acid-base status and their monitoring
- Neurological monitoring (SSPE, EEG and cerebral function monitor)
- Aseptic technique.
- Cardiac surgery team, profession and terminology, scope of perfusion technology

Physiology of Extracorporeal circulation Heart - Lung machine

- Principles of extracorporeal circulation
- Materials used in EC circuit
- Principles of extracorporeal gas exchange

47 Various types of oxygenators

- Bubble oxygenators
- Rotating spiral/cylinder/disc oxygenators
- Membrane oxygenators
- Mechanism of action components defoaming, rated flow.

Theory of blood pumps

- Ideal blood pump, pulsatile versus non-pulsatile flow, occlusive and non-occlusive pumps, various types of pumps roller, bellows, siphon, diaphragm, ventricular and centrifugal pumps.

Element of extracorporeal circulation/hazards of:

- a. Blood failure
- b. Bubble trap
- c. Flow meters
- d. Temperatures
- e. Heat exchanger
- f. Regulating devices

Connection of the vascular system with extracorporeal circulation:

- Arterial and venous cannulae.
- Connecting tubes and connectors
- Vents
- Suckers
- Cardioplegia delivery system

- Venous drainage.

Haemodynamic of arterial return, venous drainage, cardioplegia Delivery and venting.

Blood banking, handling of blood products and their management. Blood components and their use.

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 100 marks.

Distribution of type of questions and marks for Introduction to Perfusion Technology shall be as given under

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	12	12 x 5	60
SHORT ANSWER (SA)	10	10 x 2	20
TOTAL MARKS			100

PRACTICAL EXAMINATION 40 Marks

III YEAR B.Sc PERFUSION TECHNOLOGY

Paper-I Perfusion Technology Clinical

1. Pharmacokinetics and Pharmacodynamics of Cardiopulmonary bypass
2. Drugs (including anesthetic drugs) used in cardiopulmonary bypass
3. Conduct and monitoring of Cardiopulmonary bypass
4. Adequacy of perfusion - General considerations, specific aspects of perfusion, monitoring, other concomitants which may affect its adequacy
5. Pulsatile perfusion - Introduction, theory & physiology of pulsatile flow, hemodynamic, metabolic Effects, Clinical use, hematological effects
6. Cannulation techniques during cardiopulmonary bypass
7. Termination of cardiopulmonary bypass - principles and methodology
8. Myocardial protection and cardioplegia- pretreatment of the Myocardium, cardioplegia, hypothermia, controlled reperfusion, myocardial protection for specific clinical problems, Complications of cardioplegia. Non cardioplegic methods during cardiac surgery on cardiopulmonary bypass

9. Oxygenation - general consideration, bubble & membrane (including assessment and comparison of oxygenator function)
10. Heat exchangers-principles function of heat exchangers & their assessment. Complications related to heat exchange and their management
11. Priming fluids and hemodilution

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 100 marks. Distribution of type of questions and marks for Paper-I - Perfusion Technology - Clinical shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	12	12 x 5	60
SHORT ANSWER (SA)	10	10 x 2	20
TOTAL MARKS			100

PRACTICAL EXAMINATION

One common practical for all the three papers with equal weight age of marks i.e. 40 practical marks for each paper.

III YEAR B.Sc PERFUSION TECHNOLOGY

Paper-II Perfusion Technology – Applied

1. Blood cell trauma - analysis of forces of fluid motion, effects of physical forces on blood cell, clinical effect. Complications of blood transfusion.
2. Anticoagulation on bypass, its monitoring, its reversal and complications. Heparin less bypass. Platelet aggregation and platelet dysfunction. Coagulopathies due to cardiopulmonary bypass and its management.

3. Inflammatory response to cardiopulmonary bypass & its clinical effects. Methods to minimize the same. Immune response, neuroendocrine, renal, metabolic splanchnic response, pulmonary response and electrolyte response to cardiopulmonary bypass
4. Blood conservation hemofiltration & dialysis during cardiopulmonary bypass including modified ultra-filtration reverse autologous priming and other methods
5. Micro emboli- gaseous and particulate, filters used in cardiopulmonary bypass circuit.
6. Micro pore filtration during cardiopulmonary bypass
7. Counter pulsation techniques and assist devices

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 100 marks.

Distribution of type of questions and marks for Paper-II - Perfusion Technology Applied shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	12	12 x 5	60
SHORT ANSWER (SA)	10	10 x 2	20
TOTAL MARKS			100

PRACTICAL EXAMINATION

One common practical for all the three papers with equal weight age of marks i.e. 40 practical marks for each paper.

III YEAR B.Sc PERFUSION TECHNOLOGY

Paper-III Perfusion Technology - Advanced

1. Perfusion techniques for Paediatric cardiac surgery
2. ECMO- special perfusion techniques for special cardiac surgeries and medical conditions (Including thoracic aortic surgeries deep hypothermia and circulatory arrest).
Perfusion for non cardiac surgery, invasive cardiology and outside the operation suite.
3. Perfusion as a method of cardiopulmonary bypass
4. Complications and safety during cardiopulmonary bypass - bypass safety, organizational aspects, accidents, coagulopathies, mechanical and electrical failures, perfusion management, perfusion systems, safety for the perfusionist and surgical team management of perfusion accidents.
5. Minimally invasive surgery and the perfusionist
6. Recent advances in perfusion techniques
7. Experimental perfusion

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 100 marks.

Distribution of type of questions and marks for Paper-III - Perfusion Technology Advanced shall be as given under.

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	12	12 x 5	60
SHORT ANSWER (SA)	10	10 x 2	20
TOTAL MARKS			100

PRACTICAL EXAMINATION

One common practical for all the three papers with equal weight age of marks i.e. 40 practical Marks for each paper

2.11 No: of hours per subject

As given under clause “Content of each subject in each year “

2.12 Practical training

As given under clause “Content of each subject in each year “

2.13 Records

To be maintained for all Practical Work and duly signed by the supervising teacher should be submitted at the time of University practical examination

2.14 Dissertation:

Not Applicable

2.15 Speciality training if any

Cardiology, Nephrology, Blood Bank, Sterilization Room, Anesthesia etc according to the facility.

2.16 Project work to be done if any

Not Applicable

2.17 Any other requirements [CME, Paper Publishing etc.]

As per direction of HOD

2.18 Prescribed/recommended textbooks for each subject

Anatomy- Chaurasia

Physiology-Chembulingam

Biochemistry-Vasudevan

Microbiology- Ananthanarayanan

Pathology-Harsh Mohan

Pharmacology-Tripathi

Medicine- Davidson

Perfusion Technology- Gravlee

2.19 Reference books

Anatomy

- 1 William Davis (P) understanding Human Anatomy and Physiology MC Graw Hill
2. Chaurasia –A Text book of Anatomy T.S. Ranganathan – A text book of Human Anatomy
- 3.Fattana, Human anhiatomy (Description and applied) Saunder’s & C P Prism Publishers, Bangalore – 1991
4. ESTER. M. Grishcimer, Physiology & Anatomy with Practical Considerations, J.P. Lippin Cott. Philadelphia
- 5.Essential of Human embryology, Bhatnagar revised edition, Orient Longman PVT Ltd.

Physiology

1. Guyton (Arthur) Text Book of Physiology. Latest Ed. Prism publishers
2. Chatterjee(CC) Human Physiology Latest Ed. Vol-1, Medical Allied Agency
3. Choudhari (Sujith K) Concise Medical Physiology Latest Ed. New Central Book,
4. Ganong (William F) Review of Medical Physiology. Latest Ed. Appleton

Biochemistry

1. Varley – Clinical chemistry
1. TEITZ – Clinical chemistry
2. Kaplan – Clinical chemistry-Ramakrishna(S) Prasanna(KG), Rajna® Text book of Medical Biochemistry Latest Ed Orient longman Bombay –1980
3. Vasudevan (DM) Sreekumari(S) Text book of Biochemistry for Medical students ,Latest Ed

4. DAS (Debajyothi) Biochemistry Latest Edition Academic, Publishers, Calcutta
5. Text Book of Medical Biochemistry – 3rd Edition, Orient Longman PVT Ltd
6. Practical Biochemistry for Medical Students – Rajagopal, Orient Longman PVT Ltd

Pathology

1. Culling Histopathology techniques
2. Bancroft Histopathology techniques
3. Koss – cytology
4. Winifred Greg – Diagnostic cytopathology
5. Orell – Cyto Pathology
6. Todd & Sanford Clinical Diagnosis by laboratory method
7. Dacie & Lewis – Practical Haematology
8. Ramanic Sood, Laboratory Technology (Methods and interpretation) 4th Ed. J.P. Bros, New Delhi –1996)
9. Satish Gupta Short text book of Medical Laboratory for technician J.P. Bros, New Delhi – 1998
10. Sachdev K.N. Clinical Pathology and Bacteriology 8th Ed, J.P. Bros, New Delhi-1991.
10. Krishna - Text book of Pathology, Orient Longman PVT Ltd. Bacteriology 8th Ed, J.P.

Microbiology

1. Anathanarayana & Panikar Medical Microbiology
 2. Roberty Cruckshank – Medical Microbiology – The Practice of Medical Microbiology
 3. Chatterjee – Parasitology – Interpretation to Clinical medicine.
 4. Rippon – Medical Mycology
 5. Emmons – Medical mycology
 6. Basic laboratory methods in Parasitology, 1st Ed, J P Bros, New Delhi – 199
 7. Basic laboratory procedures in clinical bacteriology, 1st Ed, J P Brothers, New Delhi
- 2nd year Syllabus

APPLIED PHARMACOLOGY

Recommended Books.

1. R. S. Satoskar, S.D. Bhandarkar, S. S. Ainapure, Pharmacology and Pharmacotherapeutics, 18th Edition, single Volume, M/S Popular Prakashan, 350, Madan Mohan Marg, Tardeo, Bombay – 400 034.
2. K.D. Tripathi, Essentials of Medical Pharmacology, V. Edition, M/s. Jaypee Brothers, Post Box, 7193, G-16, EMCA House, 23/23, Bansari Road, Daryaganj, New Delhi.
3. Laurence and Bennet, Clinical Pharmacology, ELBS Edition, 9th Edition

2.20 Journals

1. Annals of Thoracic surgery
2. Journal of Indian association of Perfusions
3. Journal of American Society of Extra corporeal Technicians
4. IACTS journal

2.21 Log book

To be maintained for all academic work which shall be counter signed by concerned HOD

3. EXAMINATIONS

3.1 Eligibility to appear for exams

The candidate must secure a minimum of 50% marks for internal assessment in theory and practical separately of a particular subject and minimum of 80% attendance in all subjects (theory and practical) in order to appear in the university examination

3.2 Schedule of regulars/supplementary exams

There will be two examinations in a year (regular and supplementary), to be conducted as per notification issued by university from time to time. Supplementary examination shall be conducted by the university for the benefit of unsuccessful candidates, within six months from the date of announcement of results.

The particulars of the subjects for various examinations and distributions of marks are shown separately in the scheme of examination.

3.3 Scheme of Examination showing maximum marks and minimum marks

There shall be three regular examinations, one each at the end of I, II and III year. Distribution of Subjects and marks for First Year, Second year & Third year University theory and practical Examinations are shown in the Table - IV, V & VI.

First year examination:

The University examination for 1st year shall consist of only theory examination and there shall be no University Practical Examination.

Second & Third year examination:

The University examination for 2nd and 3rd year shall consist of Written Examination & Practical.

Written Examinations consists of

04 papers in the 2nd Year

03 papers in the 3rd Year.

Practical examination:

Two practical examinations, at the end 2nd Year and three practical examinations at the end of the 3rd year.

TABLE-IV**Names of Subjects and Distribution marks****First Year Examination**

SI No	Main Subjects*	Written Paper		I.A Theory	Total
		Duration	Marks	Marks	Marks
1	Basic Anatomy [Including Histology]	3 hours	80	20	100
2	Physiology	3 hours	80	20	100
3	Biochemistry	3 hours	80	20	100
4	Pathology	3 hours	80	20	100
5	Microbiology	3 hours	80	20	100
	Total				500

Note: * I A = Internal Assessment

Main Subjects shall have University Theory Examination.

There shall be no University Practical Examination.

The candidate must secure a minimum of 50% marks for internal assessment in theory separately of a particular subject

TABLE - V**Second Year Examination**

Paper	Subjects	Theory				Practicals			Grand Total
		Theory	Viva voce	IA	Sub Total	Practicals	IA	Sub Total	
I	Section A – Applied Pathology	50							200
	Section B - Applied Microbiology	50	30	20	150	40	10	50	
II	Introduction to Perfusion Technology	100	30	20	150	40	10	50	200
III	Pharmacology	80	--	20	100	No Practicals			100
IV	Medicine relevant to Perfusion Technology	80	--	20	100	No Practicals			100
	Total								600

The candidate must secure a minimum of 50% marks for internal assessment in theory and practical separately of a particular subject

TABLE –V1**Third Year Examination**

Paper	subjects	Theory				Practicals			Grand Total
		Theory	Viva voce	I A	Sub Total	Practicals	I A	Sub Total	
I	Perfusion Technology – Clinical	100	30	20	150	40	10	50	200
II	Perfusion Technology – Applied	100	30	20	150	40	10	50	200
III	Perfusion Technology – Advanced	100	30	20	150	40	10	50	200
								150	600

Practicals-One common practical for all the three papers with equal weight age of marks i.e. 40 practical mark and 10 I.A. marks for each paper

3.4 Papers in each year

As given under scheme of examination.

3.5 Details of theory exams

As given under 10 & 25

TYPE OF QUESTION	NUMBER OF QUESTIONS	MARKS	SUB-TOTAL
LONG ESSAY (LE)	2	2 x 10	20
SHORT ESSAY (SE)	6	6 x 5	30
SHORT ANSWER (SA)	10	10 x 3	30
TOTAL MARKS			80

As per clause 3.3

3.6 Model question paper for each subject with question paper pattern

QP Code:

Reg. No.:.....

First Year B.Sc Perfusion Technology Degree Examinations

(Model Question Paper)

Basic Anatomy (Including Histology)

Time: 3hrs

Maximum marks: 80

Answer all questions

Draw diagrams wherever necessary

Essay

(2x10=20)

1. Describe heart under the following headings:

- Coverings
- Surfaces
- Arterial supply
- Right atrium
- Applied importance

(2+2+2+3+1=10)

2. Describe right lung under the following headings:

Surfaces and borders Hilum Microscopy Broncho pulmonary segments

(2+2+3+3=10)

Short notes

(6x5=30)

3. Kidney

4. Connective tissue cells

5. Skin

6. Spleen

7. Prostate

8. Uterus

Answer briefly

(10x3=30)

9. Circle of Willis

10. Deltoid

11. Cornea

12. Transitional epithelium

13. Appendix

14. Fertilization

15. Gall bladder

16. Haversian system

17. Aorta

18. Left and right coronary artery

QP Code:

Reg. No.:.....

First Year B.Sc Perfusion Technology Degree Examinations

(Model Question Paper)

Physiology

Time: 3hrs

Maximum marks: 80

- Answer all questions
- Draw diagrams wherever necessary

Essay (2x10=20)

1. Define coagulation of blood and name the coagulation factors. Explain the intrinsic mechanism of blood coagulation (1+4+5=10)
2. Define blood pressure and mention its normal values. What are the determinants of blood pressure. Add a note on regulation of stroke volume.

(2+3+5=10)

Short notes (6x5=30)

3. Plasma proteins
4. Heart sounds
5. Rh factor
6. Refractive errors
7. Factors affecting glomerular filtration rate
8. Action potential on a nerve and its ionic basis

Answer briefly (10x3=30)

9. Surfactant
10. Vital capacity
11. Cretinism
12. Triple response
13. E.S.R
14. Anticoagulants
15. Tests of ovulation

16. Selection criteria of a blood donor

17. Hemoglobin

18. Conducting system of heart

QP Code:

Reg. No.:.....

First Year B.Sc Perfusion Technology Degree Examinations

(Model Question Paper)

Microbiology

Time: 3hrs

Maximum marks: 80

- Answer all questions
- Draw diagrams wherever necessary

Essay

(2x10=20)

1. Define sterilization. List the different methods of sterilization and explain the principles involved in the functioning of autoclave and diagram. Mention the articles which can be sterilized by autoclave

(2+2+4+2=10)

2. Describe the clinical features, laboratory diagnosis, prophylaxis and treatment of tetanus

(3+3+4=10)

Short notes

(6x5=30)

3. Hospital acquired infections

4. Bacterial growth curve

5. Infective endocarditis

6. Biomedical waste management

7. Hydatid cyst

8. Laboratory diagnosis of pulmonary tuberculosis

Answer briefly

(10x3=30)

9. Differential staining

10. Morphology of bacteria
11. Bacterial filters
12. Anaerobic culture methods
13. Hot air oven
14. Candidiasis
15. Enrichment media
16. Immunization schedule
17. Antiseptics
18. Antibiotic sensitivity testing



QP Code:

Reg. No.:.....

**First Year B.Sc Perfusion Technology Degree Examinations
(Model Question Paper)**

Pathology

Time: 3hrs

Maximum marks: 80

- Answer all questions
- Draw diagrams wherever necessary

Essay (2x10=20)

1. Describe the microscopic examination of urine in detail
2. Explain the tissue processing for routine paraffin sections in detail

Short notes (6x5=30)

3. H & E staining
4. PCV
5. Normal haemostatic pathway
6. Stool examination
7. Classification of fixatives with examples
8. Mounting technique and various mountants used

Answer briefly (10x3=30)

9. Findings of CSF in TB meningitis.
10. Horning and stropping.
11. Sputum examination.
12. Prothrombin time
13. Biomedical waste
14. Differences between transudate and exudate
15. Normal constituents of blood.
16. Cross matching.
17. Different types of urine sample.

18. Specific gravity estimation of urine.

QP Code:

Reg. No.:.....

First Year B.Sc Perfusion Technology Degree Examinations

(Model Question Paper)

Biochemistry

Time: 3hrs

Maximum marks: 80

- Answer all questions
- Draw diagrams wherever necessary

Essay (2x10=20)

1. Explain the Henderson – Hasselbach equation. Describe the important body buffers. (6+4=10)

2. Define normality. Explain the preparation of exactly 0.1 N HCl solution by secondary titration procedure (2+8=10)

Short notes (6x5=30)

3. Ionization of water

4. Anticoagulants

5. Principle, parts and use of colorimeter

6. Care and cleaning of glass wares

7. Centrifuge

8. Estimation of serum electrolyte

Answer briefly (10x3=30)

9. Lipid profile

10. Basal metabolic rate

11. Pre analytical variables
12. Pauli's exclusion principle
13. Roth era's test
14. Blood urea estimation
15. Safety measures in the laboratory
16. Metabolic acidosis
17. pH meter
18. What is the normality of 12% NaOH solution

QP Code:

Reg. No.:.....

Second Year B.Sc Perfusion Technology Degree Examinations

(Model Question Paper)

Applied Pathology & Applied Microbiology

Time: 3hrs

Maximum marks: 100

- Answer all questions
- Draw diagrams wherever necessary
- Write Section A and Section B in Separate answer book (32 Pages). Do not mix up questions from Section A and Section B

SECTION A	Applied Pathology	50
Essay		(2x10=20)

1. Briefly describe the causes, mechanism, effects and laboratory diagnosis of acute renal failure

2. Define anemia. Mention the classification and diagnosis of anemia. What are the causes of haemolytic anemia. Short notes

(4x5=20)

3. Laboratory tests used to diagnose bleeding disorders.

4. Pneumoconiosis.

5. Pericardial effusion.

6. Pathophysiology of heart failure.

Answer briefly

(5x2=10)

7. Risk factors of hypertension.

8. Pathogenesis of atherosclerosis.

9. Causes of cardio myopathy.

10. Classify congenital heart disease with suitable examples.

11. Pathology of mitral stenosis.

SECTION B

Applied Microbiology

50

Essay

(2x10=20)

1. Briefly describe the health care associated infections.

2. Briefly describe the different methods of bio-medical waste management.

Short notes

(4x5=20)

3. Mycobacterium tuberculosis.

4. Pseudomembranous colitis.

5. Antibiotic sensitivity tests.

6. Emerging infections.

Answer briefly

(5x2=10)

7. Passive immunisation.

8. Toxoids.

9. Antimicrobial resistance.

10. Normal flora of genito urinary tract.

11. Coliform count.

QP Code:

Reg. No.:.....

Second Year B.Sc Perfusion Technology Degree Examinations

(Model Question Paper)

Introduction to Perfusion Technology

Time: 3hrs

Maximum marks: 100

•Answer all questions

•Draw diagrams wherever necessary

Essay

(2x15=30)

1. Discuss the various types of oxygenators. What is an Ideal blood pump. Differentiate between pulsatile and non-pulsatile flow. Occlusive and non-occlusive pumps.

2. Describe the Principles of extracorporeal circulation. Discuss the Materials used in EC circuit. Explain the principles of extracorporeal gas exchange.

Short notes

(5x7=35)

3. Haematological monitoring in CPB.
4. Bubble trap.
5. Connection of the vascular system with extracorporeal circulation.
6. Hazards of extra corporeal circulation.
7. Neurologic complications of CPB.

Answer briefly

(7x5=35)

8. Azygous flow principle.
9. Controlled cross circulation.
10. Artificial heart valves.
11. Cardioplegia delivery system.
12. Management of hyperkalaemia.
13. Coronary vasodilators.
14. Anticoagulants.

QP Code: _____

Reg. No.:.....

Second Year B.Sc Perfusion Technology Degree Examinations

(Model Question Paper)

Pharmacology

Time: 3hrs

Maximum marks: 80

•Answer all questions

•Draw diagrams wherever necessary

Essay

(2x10=20)

1. Classify anti- hypertensive. Describe the mechanism of action, dosage, side effects, contra indications and uses of Metaprolol.
2. Classify general anaesthetics. Describe the pharmacokinetics and pharmaco dynamics of inhaled anaesthetic agents. Mention the uses and side effects of halothane.

Short notes

(6x5=30)

3. Drugs used in metabolic and electrolyte imbalance
4. Immunosuppressive agents
5. Mechanism of action, dosage, side effects and route of administration of diuretics
6. Pharmacotherapy of bronchial asthma.
7. Classification, mechanism of action, adverse effects and complications of corticosteroids
8. Classification, spectrum of activity, routes of administration and adverse effects of Penicillin.

Answer briefly

(10x3=30)

9. Advantages of enteral route of drug administration
10. First pass metabolism of drugs
11. Name 3 sympathomimetic drugs. Mention its uses
12. Name 3 cardiac glycosides .Mention its uses.
13. Management of digoxin toxicity.
14. Management of hyperkalaemia.
15. Coronary vasodilators.
16. Lipid lowering agents.

17. Anticoagulants.

18. Drugs used in the treatment of shock .

QP Code:

Reg. No.:.....

Second Year B.Sc Perfusion Technology Degree Examinations

(Model Question Paper)

Medicine Relevant to Perfusion Technology

Time: 3hrs

Maximum marks: 80

- Answer all questions
- Draw diagrams wherever necessary

Essay (2x10=20)

1. Discuss rheumatic heart disease. Describe the pathology , clinical features, diagnosis and management of mitral stenosis.
2. Classify anti -hypertensive. How will you investigate a case of primary hypertension. What is malignant hypertension. .

Short notes (5x7=35)

3. Rheumatic carditis.
4. Aortic aneurism.
5. Management of pulmonary oedema.
6. Pharmacotherapy of bronchial asthma.
7. Anaemia.

Answer briefly (5x5=25)

8. Coronary vasodilators.
9. Drugs used in the treatment of shock
10. Infective endocarditis.
11. Artificial heart valves.
12. Cardiac glycosides.

Q.P. CODE: -----

Reg. No:

Third Year B.Sc Perfusion Technology Degree Examinations, September 2015

Paper-I Perfusion Technology Clinical

Time: 3 Hrs

Max. Marks: 100

Answer all questions

Draw diagram wherever necessary

Essays: (2×15=30)

1. A 62 years old man was diagnosed to have triple vessel disease. His height is 165cm, and weight 80 Kg. How will you proceed to conduct and monitor cardio pulmonary bypass?
2. Discuss the principles and methodology for termination of cardio pulmonary bypass.

Short notes:

(5×7=35)

3. Pulsatile flow.
4. Cardioplegia.
5. Priming Fluids.
6. Complications of heat exchanger and its management.

7. Haemodilution.

Answer briefly:

(7x5=35)

8. Changes in Drug Pharmacokinetics due to CPB.

9. Controlled reperfusion.

10. Myocardial protection.

11. Bubble oxygenators.

12. Non -cardioplegic methods during cardiac surgery on CPB.

13. Adequacy of perfusion.

14. Amidarone.

Q.P. CODE: -----

Reg. No:

Third Year B.Sc Perfusion Technology Degree Examinations, September 2015

Paper-II Perfusion Technology .Applied

Time: 3 Hrs

Max. Marks: 100

Answer all questions

Draw diagram wherever necessary

Essays:

(2x15=30)

1. Discuss in detail inflammatory responses during cardiopulmonary bypass & its clinical effects. What are the methods to minimise them?

2. Discuss the principles of anticoagulation on cardio pulmonary bypass. How will you monitor and reverse heparin effect. What are its complications?

Short notes:

(5x7=35)

3. Modified ultra filtration.
4. Methods of blood conservation during cardiopulmonary bypass.
5. Priming fluids.
6. IABP.
7. Coagulopathies during CPB and its management.

Answer briefly:

(7x5=35)

8. Prevention & treatments of Acute Lung Injury in CPB.
9. Thrombo elastogram.
10. Aprotinin.
11. Unusual problems in CPB.
12. Bivalirudin.
13. Management of protamine reaction.
14. Complications of blood transfusion.

Q.P. CODE: -----

Reg. No:

Third Year B.Sc Perfusion Technology Degree Examinations, September 2015

Paper-III Perfusion Technology. Advanced

Time: 3 Hrs

Max. Marks: 100

Answer all questions

Draw diagram wherever necessary

Essays:

(2x15=30)

1. Discuss the indications, contra-indications and complications associated with ECMO.

2. What are the complications during CPB? Describe how you will manage each complication.

Short notes

(5x7=35)

3. Perfusion for minimally invasive cardiac surgery

4. Uses of CPB in non cardiac surgery

5. Special considerations in perfusion during cardiac surgery in infants.

6. Spinalcord protection in aortic surgery.

7. Recent advances in perfusion techniques.

Answer briefly:

(7x5=35)

8. Measures to improve cardiac surgery teamwork.

9. Left heart bypass.

10. Myocardial protection and preservation for neonates and infants.

11. Milrenon.

12. Coronary angiogram.

13. Deep hypothermic circulatory arrest.

14. Non cardiac uses of CPB.

3.7 Internal assessment Component

Minimum three internal assessment examinations of which the third one is University modal and mandatory, for theory and practical shall be conducted in each subject during a year and average marks of two best performances shall be taken into consideration for the award of internal marks. Marks of evaluation by other methods like assignments, seminars, projects etc. can be added to the internal marks. A candidate must obtain 50% of marks in internal assessment to be eligible to write the university examination. The class average of internal assessment marks of the whole class should not exceed 75% of maximum marks for regular examination and 80% for supplementary

examination both in theory and practical examination. The candidates who have failed to obtain the minimum internal marks should be given another chance to improve their internal assessment mark only before the next scheduled university examination. No improvement for internal examination.

3.8 Details of practical/clinical practical exams

As given under clause “Content of each subject in each year “.

3.9 Number of examiners needed [internal & External], and their qualification

Postgraduate Degree with 5 Years Post PG Teaching Experience in the same subject

3.10 Details of viva:

As given under clause “Content of subject in each year “

4. INTERNSHIP

4.1 Eligibility for internship

Only after passing the 3rd year examination the student will peruse internship.

The internship will consist of compulsory rotating practical training in the various subjects duly certified by the Head of department.

4.2 Details of Internship, Duration

One Year

Each student should undergo one month in Paediatric Surgery, One month in Thoracic Surgery, One month in Vascular Surgery. If any of these specialty is not available in the hospital where the candidate studied he/she may be send to the nearest reputed centre in Kerala for training

4.3 Model of Internship Mark lists

Nil

4.4 Extension rules:

- Any other leave other than eligible leave less than six months has to be compensated by extension granted by Principal.
- **Extension of internship:** Internship shall be extended by the number of days the student remains absent. These extended days of internship should be completed in the respective external/internal institution.

4.5 Details of Training given

Duration: The duration of internship will be for one academic year (10 months).

Internship posting: During the internship year the candidates should do 5 months of internship in an external institute (approved by KUHS) and the remaining 5 months in the parent institute.

Maintenance of records by students: Every student should maintain records of the number of hours of clinical work in different areas and institutions. This should be certified by the head of the institution or his/her nominee where the student is undergoing internship. The students should get the appraisal form duly filled by the supervisors in the respective institutions where they are undergoing internship and should be submitted to the parent institution in order to obtain internship completion certificate from the parent institutes

5. ANNEXURES

5.1 Check Lists for Monitoring: Log Book, Seminar Assessment etc. to be formulated by the curriculum committee of the concerned Institution