

## SYLLABUS OF STUDY

### **I [A] HUMAN ANATOMY, EMBRYOLOGY, HISTOLOGY & MEDICAL GENETICS**

#### **[A] GOAL:**

The students should gain the knowledge and insight into, the functional anatomy of the normal human head and necks, functional histology and an appreciation of the genetic basis of inheritance and disease, and the embryological development of clinically important structures. So that relevant anatomical & scientific foundations are laid down for the clinical years of the BDS course.

#### **[B] OBJECTIVES:**

##### **[a] KNOWLEDGE & UNDERSTANDING :**

At the end of the 1<sup>st</sup> year BDS course in Anatomical Sciences, the undergraduate student, is Expected to :

1. Know the normal disposition of the structures in the body while clinically examining a patient and while conducting clinical procedures;
2. Know the anatomical basis of disease and injury.
3. Know the microscopic structure of the various tissues, a pre-requisite for understanding of the disease processes;
4. Know the nervous system to locate the site of lesions according to the sensory and or motor deficits encountered
5. Have an idea about the basis of abnormal development, critical stages of development, effects of teratogens, genetic mutations and environmental hazards.
6. Know the sectional anatomy of head neck and brain to read the features in radiographs and pictures taken by modern imaging techniques.
7. Know the anatomy of cardio-pulmonary resuscitation

##### **[b] SKILLS:**

1. To locate various structures of the body and to mark the topography of the living anatomy;
2. To identify various tissues under microscope;
3. To identify the features in radiographs and modern imaging techniques;
4. To detect various congenital abnormalities.

##### **[c] INTEGRATION:**

By emphasizing on the relevant information and avoiding unwanted details, the anatomy taught integrally with other basic sciences & clinical subjects not only keeps the curiosity alive in the learner but also lays down the scientific foundation for making a better doctor, a benefit to the society.

The insight is gained in a variety of ways:

- 1] Lectures & small group teaching.
- 2] Demonstrations
- 3] Dissection of the human cadaver.
- 4] Study of dissected specimens;
- 5] Osteology;
- 6] Surface anatomy on living individual
- 7] Study of radiographs & other modern imaging techniques;

- 8] Study of Histology slides;
- 9] Study of embryology models
- 10] Audio-visual aids.

Throughout the course, particular emphasis is placed on the functional correlation, clinical application & on integration with teaching in other bio dental disciplines.

**[D] AN OUTLINE OF THE COURSE CONTENT:**

- 1.General anatomy: Introduction of anatomical terms and brief outline of various systems of the body;
- 2. Regional anatomy of head & neck with osteology of bones of head and neck ,with emphasis on topics of dental importance.
- 3. General disposition of thoracic, abdominal & pelvic organs;
- 4. The regional anatomy of the sites of intramuscular & intravascular injections, & lumbar puncture.
- 5.General embryology & systemic embryology with respect to development of head & neck;
- 6.Histology of basic tissues and of the organs of gastroinstenstinal, respiratory, Endocrine, excretory systems & gonads;
- 7.Medical genetics;

**[E] FURTHER DETAILS OF THE COURSE:**

**I. INTRODUCTION TO:**

- 1. Anatomical terms;
- 2. Skin, superficial fascia & deep fascia.
- 3. Cardiovascular system, portal system collateral circulation and arteries
- 4. Lymphatic system, regional lymph nodes
- 5. Osteology including ossification & growth of bones
- 6. Mylogy - Including types of muscle tissue & innervation;
- 7. Syndesmology - Including classification of Joints
- 8. Nervous system

**II HEAD & NECK**

- 01. Scalp, face & temple, lacrimal apparatus
- 02. Neck - Deep fascia of neck, posterior triangle, suboccipital triangle, anterior triangle, anterior median region of the neck, deep structures in the neck.
- 03. Cranial cavity - Meninges, parts of brain, ventricles of brain, dural venous sinuses, cranial nerves attached to the brain, pituitary gland.
- 04. Cranial nerves - III, IV, V, VI, VII, IX, XII in detail.
- 05. Orbital cavity - Muscles of the eye ball, supports of the eye ball, nerves and vessels in the orbit.
- 06. Parotid gland.
- 07. Temporo mandibular joint, muscles of mastication, infratemporal fossa, pterygo - palatine fossa.
- 08. Submandibular region.
- 09. Walls of the nasal cavity, paranasal air sinuses
- 10. Palate
- 11. Oral cavity, Tongue
- 12. Pharynx [palatine tonsil and the auditory tube] Larynx. **OSTEOLOGY** - Foetal skull, adult skull, individual bones of the skull, hyoid bone and cervical vertebrae.

**III. THORAX** : Demonstration on a dissected specimen of -

1. Thoracic wall
2. Heart chambers.
3. Coronary arteries
4. Pericardium
5. Lungs - surfaces; pleural cavity
6. Diaphragm

**IV ABDOMEN** - Demonstration on a dissected specimen of

1. Peritoneal cavity
2. Organs in the abdominal & pelvic cavity.

**V. CLINICAL PROCEDURES**

**[a] Intramuscular injections:** Demonstration on a dissected specimen and on a living person of the following sites of injection.

1. Deltoid muscle and its relation to the axillary nerve and a radial nerve.
2. Gluteal region and the relation of the sciatic nerve.
3. Vastus Lateralis muscle.

**[b] Intravenous injections & venesection:** Demonstration of veins in the dissected specimen and on a living person.

1. Median cubital vein
2. Cephalic vein
3. Basilic vein
4. Long saphenous vein

**[c] Arterial pulsations:** Demonstration of arteries on a dissected specimen and feeling of pulsation of the following arteries on a living person.

1. Superficial temporal
2. Facial
3. Carotid
4. Axillary
5. Brachial
6. Radial
7. Ulnar
8. Femoral
9. Popliteal
10. Dorsalispedis.

**[d] Lumbar puncture:** Demonstration on a dissected specimen of the spinal cord, cauda equina & epidural space and the inter vertebral space between L4 & L5.

**VI. EMBRYOLOGY:**

Oogenesis, Spermatogenesis, Fertilisation, Placenta, Primitive streak, Neural crest, Bilaminar and trilaminar embryonic disc, Intra embryonic mesoderm - formation and fate, notochord formation & fate, Pharyngeal arches, pouches & clefts, Development of face, tongue, palate, thyroid gland, pituitary gland, salivary glands, and anomalies in their development , Tooth development in brief.

**VII. HISTOLOGY:**

**The Cell:**

Basic tissues - Epithelium, Connective tissue including cartilage and bone, Muscle tissue, Nervous tissue: Peripheral nerve, sensory ganglion, motor ganglion, Skin

**Classification of Glands:**

Salivary glands [serous, mucous and mixed gland], Blood vessels, Lymphoid tissue, Tooth, Lip, tongue, hard palate, oesophagus, stomach, duodenum, ileum, colon, vermiform appendix,

Liver, Pancreas, Lung, Trachea, Epiglottis, Thyroid gland, parathyroid gland, supra renal gland and pituitary gland, Kidney, Ureter, Urinary bladder, Ovary and testis.

### **VIII MEDICAL GENETICS:**

Mitosis, meiosis, Chromosomes, gene structure, Mendelism, modes of inheritance.

### **RECOMMENDED BOOKS:**

1. SNELL [Richard S] Clinical Anatomy for Medical Students, Ed 5, Little Brown & company, Boston.
2. RJ LASTS Anatomy - Mc Minn, 9th edition.
3. ROMANSES [G.J] Cunningham Manual of Practical Anatomy: Head & Neck & Brain Ed.15 Vol. III, Oxford Medical Publication.
4. WHEATER, BURKITT & DANIELS, Functional Histology, Ed. 2, Churchill Livingstone.
5. SADLER, LANGMAN'S, Medical Embryology Ed.6.
6. JAMES E ANDERSON, Grants Atlas of Anatomy, Williams & Wilkins
7. WILLIAMS, Gray's Anatomy, Ed. 38, Churchill Livingstone.
8. EMERY, Medical Genetics.

## II [B] HUMAN PHYSIOLOGY

### [A] GOAL:

The broad goal of the teaching undergraduate students in Human Physiology aims at providing the student comprehensive knowledge of the normal functions of the organ systems of the body to facilitate an understanding of the physiological basis of health and disease.

### OBJECTIVES:

#### [a] KNOWLEDGE

At the end of the course, the student will be able to :

1. Explain the normal functioning of all the organ systems and their interactions for well co-ordinated total body function
2. Assess the relative contribution of each organ system towards the maintenance of the milieu interior.
3. List the physiological principles underlying the pathogenesis and treatment of disease.

## [b] SKILLS

At the end of the course , the student shall be able to :

1. Conduct experiments designed for the study of physiological phenomena.
2. Interpret experimental and investigative data.
3. Distinguish between normal and abnormal data derived as a result of tests which he/she has performed and observed in the laboratory.

## [c] INTEGRATION :

At the end of the integrated teaching the student shall acquire an integrated knowledge of organ structure and function and its regulatory mechanisms.

## [B] COURSE CONTENTS THEORY

### 1. GENERAL PHYSIOLOGY

1. Homeostasis: Basic concept, Feed back mechanisms.
2. Structure of cell membrane, transport across cell membrane
3. Membrane potentials.

### 2. BLOOD:

Composition & Functions of blood.

Specific gravity, Packed cell volume, factors affecting & Methods of determination, Plasma proteins - Types, concentration, functions & Variations.

Erythrocyte - Morphology, functions & Variations, Erythropoiesis & Factors affecting erythropoiesis.

ESR - Methods of estimation, factors affecting, variations & significance

Haemoglobin - Normal concentration, method of determination & variation in concentration

Blood Indices - MCV, MCH, MCHC - Definition, normal values, variation

Anaemia - Definition, classification, life span of RBC's, destruction of RBC's, formation & fate of bile pigments, Jaundice - types.

Leucocytes: Classification , number, percentage, distribution morphology, properties, functions & variations . Role of lymphocytes in immunity, leucopoiesis life span & fate of leucocytes

Thrombocytes - Morphology, number, variations, function & thrombopoiesis

Haemostasis - Role of vasoconstriction, platelet plug formation in haemostasis, coagulation factors, intrinsic & extrinsic pathways of coagulation, clot retraction.

Tests of haemostatic function, platelet count, clotting time, bleeding time, prothrombin time - normal values, method & variations. Anticoagulants - mechanism of action. Bleeding disorders.

Blood Groups: ABO & Rh system, method of determination, importance, indications & dangers of blood transfusion, blood substitutes.

Blood volume: Normal values, variations.

Body fluids: distribution of total body water, intracellular & extracellular compartments, major anions & cations in intra and extra cellular fluid.

Tissue fluids & lymph: Formation of tissue fluid, composition, circulation & functions of lymph. Oedema - causes.

Functions of reticulo endothelial system.

### 3. MUSCLE AND NERVE:

Classification of nerves, structure of skeletal muscle - Molecular mechanism of muscle contraction, neuromuscular transmission, Properties of skeletal muscle. Structure and properties of cardiac muscle & smooth muscle.

#### 4. DIGESTIVE SYSTEM:

Introduction to digestion: General structure of G.I. tract, Innervation

Salivary glands, Structure of salivary glands, composition, regulation of secretion & functions of saliva.

Stomach: Composition and functions of gastric juice, mechanism and regulation of gastric secretion.

Exocrine Pancreas - Structure, composition of pancreatic juice, functions of each component, regulation of pancreatic secretion.

Liver: Structure, composition of bile, functions of bile, regulation of secretion -

Gall Bladder: Structure, functions

Small intestine: Composition, functions & regulation of secretion of intestinal juice.

Large intestine - Functions.

Motor functions of GIT : Mastication, deglutition, gastric filling & emptying, movements of small and large intestine, defecation.

#### [5] EXCRETORY SYSTEM:

Structure & functions of kidney, functional unit of kidney & functions of different parts.

Juxta glomerular apparatus, renal blood flow.

Formation of Urine: Glomerular filtration rate - definition, determination, normal values, factors influencing G.F.R. Tubular reabsorption - Reabsorption of sodium, glucose, water & other substances, Tubular secretion - secretion of urea, hydrogen and other substances.

Mechanism of concentration & dilution of urine.

Role of kidney in the regulation of pH of the blood.

Micturition: anatomy & innervation of Urinary bladder, mechanism of micturition & abnormalities.

#### [6] BODY TEMPERATURE & FUNCTIONS OF SKIN

#### [7] ENDOCRINOLOGY:

General endocrinology - Enumeration of endocrine glands & hormones - General functions of endocrine system, chemistry, mechanism of secretion, transport, metabolism, regulation of secretion of hormones.

Hormones of anterior pituitary & their actions, hypothalamic regulation of anterior pituitary function. Disorders of secretion of anterior pituitary hormones.

Posterior pituitary: Functions, regulations & disorders of secretion.

Thyroid: Histology, synthesis, secretion & transport of hormones, actions of hormones, regulation of secretion & disorders, Thyroid function test.

Adrenal, cortex & medulla - synthesis, secretion, action, metabolism, regulation of secretion of hormones & disorders.

Other hormones - Angiotensin, A.N.F.

#### [8] REPRODUCTION

Sex differentiation, Physiological anatomy of male and female sex organs. Female reproductive system: Menstrual cycle, functions of ovary, actions of oestrogen Progesterone, control of secretion of ovarian hormones, tests for ovulation , fertilization, implantation, maternal changes during pregnancy, pregnancy tests & parturition.

Lactation, composition of milk, factors, controlling lactation, milk ejection, reflex.

Male reproductive system: spermatogenesis, semen and contraception.

#### [9] CARDIO VASCULAR SYSTEM

Functional anatomy and innervation of heart, Properties of cardiac muscle

Origin & propagation of cardiac impulse and heart block

Electrocardiogram - Normal electrocardiogram. Two changes in ECG in myocardial infarction.

Cardiac cycle - Phases, Pressure changes in atria, ventricles & aorta. Volume changes in ventricles.

Jugular venous pulse, arterial pulse.

Heart sounds: Mention of murmurs.

Heart rate: Normal value , variation & regulation

Cardiac output: Definition, normal values , one method of determination, variation factors affecting heart rate and stroke volume.

Arterial blood pressure: Definition, normal values & variation, determinations, regulation & measurement of blood pressure.

Coronary circulation.

Cardio vascular homeostasis - Exercise & posture.

#### [10] RESPIRATORY SYSTEM:

Physiology of Respiration: External & internal respiration.

Functional anatomy of respiratory passage & lungs.

Respiratory movements: Muscles of respiration, Mechanism of inflation & deflation of lungs Intra pleural & intra pulmonary pressures & their changes during the phases of respiration.

Mechanics of breathing - surfactant, compliance & work of breathing.

Spirometry: Lung volumes & capacities definition, normal values, significance, factors affecting vital capacity, variations in vital capacity, FEV & its variations.

Pulmonary ventilation - alveolar ventilation & dead space - ventilation.

Composition of inspired air, alveolar air and expired air.

Transport of Oxygen & carbon dioxide in the blood.

Regulation of respiration - neural & chemical.

Hypoxia, cyanosis, dyspnoea, periodic breathing.

Artificial respiration, pulmonary function tests.

#### [11] CENTRAL NERVOUS SYSTEM:-

1. Organisation of central nervous system.

2. Neuronal organisation at spinal cord level.

3. Synapse receptors, reflexes, sensations and tracts

4. Physiology of pain.

5. Functions of cerebellum, thalamus, hypothalamus and cerebral cortex.

6. Formation and functions of CSF.

7. Autonomic nervous system.

#### [12] SPECIAL SENSES:

Fundamental knowledge of vision, hearing, taste and smell.

### PRACTICALS:

The following list of practical is minimum and essential. All the practical have been categorized as procedures and demonstrations. The procedures are to be performed by the students during practical classes to acquire skills. All the procedures are to be included in the University practical examination. Those categorised as demonstrations are to be shown to the students during practical classes. However these demonstrations would not be included in the University examinations but question based on this would be given in the form of charts, graphs and calculations for interpretation by the students.

### PROCEDURES:

1. Enumeration of Red Blood Cells.
2. Enumeration of White Blood Cells.
3. Differential leucocyte counts.
4. Determination of Haemoglobin.
5. Determination of blood group.
6. Determination of bleeding time and clotting time.
7. Examination of pulse.
8. Recording of blood pressure.

### DEMONSTRATION:

1. Determination of packed cell volume and erythrocyte sedimentation rate.
2. Determination of specific gravity of blood.
3. Determination of erythrocyte fragility.
4. Determination of vital capacity and timed vital capacity.
5. Skeletal muscle experiments.  
Study of laboratory appliances in experimental physiology, Frog's gastrocnemius sciatic preparation. Simple muscle curve, effects of two successive stimuli, effects of increasing strength of stimuli, effects of temperature, genesis of fatigue and tetanus. Effect of after load and free load on muscle contraction, calculation of work done.
6. Electrocardiography: Demonstration of recording of normal Electrocardiogram
7. Clinical examination of cardiovascular and respiratory system.

### TEXT BOOKS:

- Guyton; Text Book of Physiology, 9th edition.
- Ganong, Review of Medical Physiology, 19th edition.
- Vander, Human physiology, 5th edition.
- Choudhari: Concise Medical Physiology, 2nd edition.
- Chatterjee: Human Physiology, 10th edition.
- A.K. Jain, Human Physiology for BDS students, 1st edition.

### BOOKS FOR REFERENCE :

- i] Berne & Levey, Physiology, 2nd edition.
- ii] West-Best & Taylor's Physiological basis of Medical Practise, 11th edition.

### EXPERIMENTAL PHYSIOLOGY:



- i] Rannade, Practical Physiology, 4th edition.
- ii] Ghai, a text book of practical physiology.
- iii] Hutchison's; Clinical Methods, 20th edition.

## [C] BIOCHEMISTRY:

### AIMS AND SCOPE OF THE COURSE IN BIOCHEMISTRY:

The major aim is to provide a sound but crisp knowledge on the biochemical basis of the life processes relevant to the human system and to dental/medical practice. The contents should be organized to build on the already existing information available to the students in the Pre-university stage and reorienting. A mere rehash should be avoided.

The chemistry portion should strive towards providing information on the functional groups, hydrophobic and hydrophilic moieties and weak valence force that organize macromolecules. Details on structure need not be emphasized.

Discussion of metabolic processes should put emphasis on the overall change, interdependence and molecular turnover. While details of the steps may be given, the student should not be expected to memorize them. An introduction to biochemical genetics and molecular biology is a must but details should be avoided. The exposure to antivitamins, antimetabolites and enzyme inhibitors at this stage, will provide a basis for the future study of medical subjects. An overview of metabolic regulation is to be taught by covering hormonal action, second messengers and regulation of enzyme activities. Medical aspects of biochemistry should avoid describing innumerable functional tests, most of which are not in vogue. Cataloguing genetic disorders under each head of metabolism is unnecessary. A few examples which correlate genotype change to functional changes should be adequate.

At the end of the course the student would be able to acquire a useful core of information, which can be retained for a long time. Typical acid tests can be used to determine what is to be taught or what is to be learnt. A few examples are given below.

1. Need not know the structure of cholesterol. Should know why it cannot be carried free in plasma.
2. Mutarotation should not be taught. Student should know why amylase will not hydrolyse cellulose.
3. Need not know the details of alpha - helix and beta - pleats in proteins should know why haemoglobin is globular and keratin is fibrous.
4. Need not know mechanism of oxidative phosphorylation. Should know more than 90% of ATP is formed by this process.
5. Need not know details of the conversion of pepsinogen to pepsin. Should know hydrochloric acid cannot break a peptide bond at room temperature.
6. Need not remember the steps of glycogenesis. Should know that excess intake of carbohydrate will not increase glycogen level in liver or muscle.
7. Need not know about urea or creatinine clearance tests. Should know the basis of increase of urea and creatinine in blood

in renal insufficiency.

8. Need not know the structure of insulin.

Should know why insulin level in circulation is normal in most cases of maturity onset diabetes.

9. Need not know the structural details of ATP.

Should know why about 10 g of ATP in the body at any given time meets all the energy needs.

10. Need not know the mechanism of action of prolylhydroxylase.

Should know why the gum bleeds in scurvy.

11. Need not know the structure of Vitamin K.

Should know the basis of internal bleeding arising due to its deficiency.

12. Need not remember the structure of HMGCoA.

Should know why it does not lead to increased cholesterol synthesis in starvation.

## BIOCHEMISTRY AND NURITION

### 1. CHEMISTRY OF BIOORGANIC MOLECULES

Carbohydrates : Definition, Biological importance and classification. Monosaccharides Isomerism, anomerism. Sugar derivatives, Disaccharides. Polysaccharides. Structures of starch and glycogen.

Lipids : Definition, biological importance and classification. Fats and fatty acids. Introduction to compound lipids. Hydrophobic and hydrophilic groups. Cholesterol. bile salts. Micelle. Bimolecular leaflet.

Proteins : Biological importance. Aminoacids : Classification. Introduction to peptides. Proteins : Simple and conjugated; globular and fibrous. Charge properties. Buffer action. Introduction to protein conformation : Denaturation.

Nucleic acids : Building units - Nucleotides. Outline structure of DNA and RNA.

High energy compounds : ATP, Phosphorylamidines, Thioesters, Enol phosphates.

### 2. MACRONUTRIENTS AND DIGESTION

Energy needs : Basal metabolic rate. Dietary carbohydrates, fibres. Dietary lipids, essential fatty acids. Nitrogen balance. Essential amino acids. Protein quality and requirement (methods for evaluation of protein quality to be excluded). Protein calorie malnutrition. Balanced diet.

Enzymatic hydrolysis of dietary carbohydrates. Mechanism of uptake of monosaccharides. Digestion and absorption of triglycerols. Enzymatic hydrolysis of dietary proteins and uptake of amino acids.

### 3. MICRONUTRIENTS

Vitamins: Definition, classification, daily requirement, sources and deficiency symptoms. Brief account of water-soluble vitamins with biochemical function. Vitamin A function including visual process. Vitamin D and its role in calcium metabolism. Vitamin E. Vitamin K and gamma carboxylation. Introduction to antivitamins and hypervitaminosis.

Minerals : Classification, daily requirement. Calcium and phosphate : sources, uptake, excretion, function, Serum calcium regulation. Iron: sources, uptake and transport.

Heme and nonheme iron functions; deficiency. Iodine: Brief introduction to thyroxine synthesis. General functions of thyroxine. Fluoride: function, deficiency and excess. Indications of role of other minerals.

#### 4.ENERGY METABOLISM

Overview : Outlines of glycolysis, pyruvate oxidation and citric acid cycle. Beta oxidation of fatty acids. Electron transport chain and oxidative phosphorylation. Ketone body formation and utilisation. Introduction to glycogenesis, glycogenolysis, fatty acid synthesis, lipogenesis and lipolysis. Gluconeogenesis. Lactate metabolism. Protein utilisation for energy. Glucogenic and ketogenic amino acids. Integration of metabolism.

#### 5.SPECIAL ASPECTS OF METABOLISM

Importance of pentose phosphate pathway. Formation of glucuronic acid. Outlines of cholesterol synthesis and breakdown. Ammonia metabolism. Urea formation. Phosphocreatine formation. Transmethylation. Amines. Introduction to other functions of amino acids including one carbon transfer. Detoxication : Typical reactions. Examples of toxic compounds. Oxygen toxicity.

#### 6.BIOCHEMICAL GENETIC AND PROTEIN SYNTHESIS

Introduction to nucleotides; formation and degradation. DNA as genetic material. Introduction to replication and transcription. Forms and functions of RNA. Genetic code and mutation. Outline of translation process. Antimetabolites and antibiotics interfering in replication, transcription and translation. Introduction to cancer, viruses and oncogenes.

#### 7.ENZYME AND METABOLIC REGULATION

Enzymes : Definition, classification, specificity and active site, Cofactors. Effect of pH, temperature and substrate concentration. Introduction to enzyme inhibitors, proenzymes and isoenzymes. Introduction to allosteric regulation, covalent modification and regulation by induction/repression.

Overview of hormones. Introduction to second messengers, cyclic AMP, calcium ion, inositol triphosphate. Mechanism of action of steroid hormones, epinephrine, glucagon and insulin in brief. Acid base regulation. Electrolyte balance.

#### 8. STRUCTURAL COMPONENTS AND BLOOD PROTEINS

Connective tissue: Collagen and elastin. Glycosaminoglycans. Bone structure. Structure of membranes. Membrane associated processes in brief. Exocytosis and endocytosis. Introduction to cytoskeleton. Myofibril and muscle contraction in brief.

Haemoglobin: functions. Introduction to heme synthesis and degradation. Plasma proteins: classification and separation. Functions of albumin. A brief account of immunoglobulins. Plasma lipoproteins: Formation, Function and turnover.

#### 9. MEDICAL BIOCHEMISTRY

Regulation of blood glucose. Diabetes mellitus and related disorders. Evaluation of glycemic status. Hyperthyroidism and hypothyroidism. Biochemical evaluation. Hyperlipoproteinemias and atherosclerosis, Approaches to treatment. Jaundice: Classification and evaluation. Liver function tests: Plasma protein pattern, serum enzymes levels. Brief introduction to kidney function tests and gastric function tests. Acid base imbalance. Electrolyte imbalance: evaluation. Gout. Examples of genetic disorders including lysosomal storage disorders, glycogen storage disorders, glucose 6.

Phosphate dehydrogenase deficiency, hemoglobinopathies, Inborn errors of amino acid metabolism and muscular dystrophy [one or two examples with biochemical basis will be adequate] Serum enzymes in diagnosis.

PRACTICALS: Contact hours 50

1. Qualitative analysis of carbohydrates.	4
2. Color reactions of proteins and amino acids	4
3. Identification of nonprotein nitrogen substance	4
4. Normal constituents of urine	4
5. Abnormal constituents of urine	2
6. Analysis of saliva including amylase	2
7. Analysis of milk quantitative estimations	2
8. Titrable acidity and ammonia in urine	2
9. Free and total acidity in gastric juice	2
10. Blood glucose estimation	2
11. Serum total protein estimation	2
12. Urine creatinine estimation Demonstration	2
13. Paper electrophoresis charts/clinical data evaluation	2
14. Glucose tolerance test profiles	2
15. Serum lipid profiles	1
16. Profiles of hypothyroidism and hyperthyroidism	1
17. Profiles of hyper and hypoparathyroidism	1
18. Profiles of liver function	1
19. Urea, uric acid creatinine profile in kidney disorder	1
20. Blood gas profile in acidosis/alkalosis	1

Recommended Books:-

- [1] Concise text book of Bio-Chemistry [3<sup>rd</sup> edition] 2001, T.N. Pattabiraman.
- [2] Nutritional Bio-Chemistry, 1995, S. Rama Krishnan and S.V. Rao.
- [3] Lecture Notes in Bio-chemistry 1984, J.K. Kandish.

Reference Books:

- [1] Text book of Bio-chemistry with clinical correlation 1997, T.N.Devlin.
- [2] Harper's Bio-Chemistry, 1996, R.K. Murray et. Al.
- [3] Basic and applied Dental Bio-Chemistry, 1979, R.A.D. Williams & J.C.Elliot.

### [III] D DENTAL ANATOMY, EMBRYLOGY AND ORAL HISTOLOGY:

INTRODUCTION:

Dental Anatomy including Embryology and Oral Histology – a composite of basic Dental Sciences & their clinical applications.

## SKILLS:

The student should acquire basic skills in:

- [1] Carving of crowns of permanent teeth in wax.
- [2] Microscopic study of Oral tissues.
- [3] Identification of Deciduous & Permanent teeth.
- [4] Age estimation of patterns of teeth eruption from plaster casts of different age groups.

## OBJECTIVES:

After a course on Dental Anatomy including Embryology and Oral Histology

- [1] The student is expected to appreciate the normal development, morphology, structure & functions of oral tissues & variations in different pathological/non pathological states.
- [2] The student should understand the histological basis of various dental treatment procedures and physiologic ageing process in the dental tissues.
- [3] The students must know the basic knowledge of various research methodologies.

## I. TOOTH MORPHOLOGY:

### 1. INTRODUCTION:

Human dentition, types of teeth, & functions, Palmer's & Binomial notation systems, tooth surfaces, their junctions – line angles & point angles, definition of terms used in dental morphology, geometric concepts in tooth morphology, contact areas & embrasures – Clinical significance.

### 2. Morphology of permanent teeth:

Description of individual teeth, along with their endodontic anatomy & including a note on their chronology of development, differences between similar class of teeth & identification of individual teeth.

Variations & Anomalies commonly seen in individual teeth.

### 3. Morphology of Deciduous teeth:

Generalized differences between Deciduous & Permanent teeth.

Description of individual teeth, including their chronology of development, endodontic anatomy, differences between similar class of teeth & identification of individual teeth.

### 4. OCCLUSION:

Definition, factors influencing occlusion – basal bone, arch, individual teeth, external & internal forces & sequence of eruption.

Inclination of individual teeth – Compensatory curves.

Centric relation & Centric occlusion – protrusive, retrusive & lateral occlusion.

Clinical significance of normal occlusion.

Introduction to & classification of Malocclusion.

## II. ORAL EMBRYOLOGY:

### 1. Brief review of development of face, jaws, lip, palate & tongue, with applied aspects.

### 2. Development of teeth:

Epithelial mesenchymal interaction, detailed study of different stages of development of crown, root & supporting tissues of tooth & detailed study of formation of calcified tissues.

Applied aspects of disorders in development of teeth.

3. Eruption of deciduous & Permanent teeth

Mechanism in tooth eruption, different theories & histology of eruption, formation of dentogingival junction, role of gubernacular cord in eruption of permanent teeth.

Clinical or Applied aspects of disorders of eruption.

4. Shedding of teeth:

Factors & mechanisms of shedding of deciduous teeth.

Complications of shedding.

III. ORAL HISTOLOGY:

1. Detailed microscopic study of Enamel, Dentine, Cementum & Pulp tissue Age changes & Applied aspects [Clinical and Forensic significance] of histological considerations – Fluoride applications, transparent dentine, dentine hypersensitivity, reaction of pulp tissue in varying insults to exposed dentine: Pulp calcification & Hypercementosis.

2. Detailed Microscopic study of Periodontal ligament & alveolar bone, age changes, histological changes in periodontal ligament & bone in normal & orthodontic tooth movement, applied aspects of alveolar bone resorption.

3. Detailed microscopic study of Oral Mucosa, variation in structure in relation to functional requirements, mechanisms of keratinization, clinical parts of gingival, Dentogingival & Mucocutaneous junctions & lingual papillae. Age changes & clinical considerations.

4. Salivary Glands:

Detailed microscopic study of acini & ductal system.

Age changes & clinical considerations.

5. T.M. Joint:

Review of basic anatomical aspects & microscopic study & clinical considerations.

6. Maxillary Sinus:

Microscopic study, anatomical variations, functions & clinical relevance of maxillary sinus in dental practice.

7. Processing of Hard & soft tissues for microscopic study:

Ground sections, decalcified sections & routine staining procedures.

8. Basic histochemical staining patterns of oral tissues.

IV. ORAL PHYSIOLOGY

1. Saliva:

Composition of saliva – variations, formation of saliva & mechanisms of secretion, salivary reflexes, brief review of secretomotor pathway, functions, role of saliva in dental caries & applied aspects of hyper & salivation.

2. Mastication:

Masticatory force & its measurement – need for mastication, peculiarities of masticatory muscles, masticatory cycle, masticatory reflexes & neural control of mastication.

3. Deglutition:

Review of the steps in deglutition, swallowing in infants, neural control of deglutition & dysphagia neural .

4. Calcium, Phosphorous & fluoride metabolism:

Source, requirements, absorption, distribution, functions & excretion, clinical considerations, hypo & hypercalcemia & hypo & hyper phosphatemia & fluorosis.

5. Theories of Mineralization:

Definition, mechanisms, theories & their drawbacks:

Applied aspects of physiology of mineralization, pathological considerations – calculus formation.

6. Physiology of Taste:

Innervation of taste buds & taste pathway, physiologic basis of taste sensation, age, changes & applied aspects – taste disorders.

7. Physiology of Speech:

Review of basic anatomy of larynx & vocal cords.

Voice production , resonators, production of vowels & different consonants- Role of palate teeth & tongue.

Effects of dental prosthesis & appliances on speech & basic speech disorders.

RECOMMENDED TEXT BOOKS:

1. Orban's Oral Histology & Embryology – S.N. Bhaskar.
2. Oral Development & Histology – James & Avery.
3. Wheeler's Dental Anatomy, Physiology & Occlusion – Major. M.Ash.
4. Dental Anatomy – Its relevance to dentistry – Woelfel & Sheid.
5. Applied Physiology of the mouth – Lavelle.
6. Physiology & Biochemistry of the mouth – Jenkins.