

Introduction

The Foundation Module occupies the fifth to tenth weeks of the first term of the MBBS degree. During this module we aim to cover some aspects of basic medical science, primarily in the subject of cell biology, basis of normal and abnormal functions, integrated in the 3 basic sciences. In addition you will learn the basics of medical genetics, histology of basic tissue types and general embryology with an introduction to molecular biology vis-à-vis medicine. The mode of teaching will centre on lectures, tutorials/small group discussions, fixed learning modules, self learning activities and practical. In addition activities will be carried out at the resource centre which will facilitate the learning process. This include computer based self learning and curriculum-related language activities in the Language Laboratory. At practical classes you will learn basic laboratory skills, handling of light microscope and identifying basic tissues under the light microscope, and be introduced to human cadaver dissection. You will have a sumative examination at the end of the term. Hope you enjoy this module.

Members of the Module Committee

Chairperson

Dr. S. Ekanayake

Convener

Mrs. L. V. Athiththan

Members

Dr .S.G. Yasawardene

Dr. Roshini Peiris John

Dr. S. Fernando

Dr. I. Jayewardene (on leave)

General Objectives

1. To describe the structures and functions of mammalian cells.
2. To describe the sub-cellular organelles and functions.
3. To describe the cell cycle.
4. To identify tissues and describe the histology of different cells using light microscope.
5. To describe the methods of transport across cell membrane, explain receptors and discuss concepts of up-regulation and down regulation.
6. To explain the cellular environment and the role of body fluids.
7. To describe the role of pH and physiological buffers.
8. To explain fluid, electrolyte and acid-base balance and the consequences of imbalance.
9. To explain the structure and function of biomolecules; proteins, carbohydrate, lipids and nucleic acids, with emphasis on medical applications.
10. To discuss the structure–function relationship of enzymes, co-factors and chemical energy in the medical context.
11. To describe the structure and function of nerve and muscle.
12. To describe development of the human embryo.
13. To explain Mendelian genetics and inheritance; and the terms, gene, genome and linkage.
14. To describe the basis of modern molecular biology and list its applications in medicine.
15. To attain skills required for basic biochemical and physiological tests and be acquainted with standard laboratory procedures.
16. To be acquainted with dissection procedures and to adopt precautions in the dissection room.

Main Content Area

Main Content Area	Lectures	Practical	Tutorials
1. Introduction to Laboratory	-	02	-
2. Cell, Cell Membrane and Cellular Environment			
2.1 Cell	02	01	01
2.2 Cell Membrane	04	01	01
2.3 Cell Environment	06	01	02
3. Biomolecules	09	03	03
4. Energy, Enzymes and Co-factors	06	01	01
5. Histology	03	03	-

Main Content Area	Lectures	Practical	Tutorials/SGD
6. Nerve, Muscle and Neurotransmitters			
6.1 Nerve	04	01	-
6.2 Muscle	03	01	01 (02 hours)
6.3 Neurotransmitters and Autonomic Nervous System	03	-	01 (02 hours)
7. General Embryology	07	-	-
8. Genetics	08	-	01
9. Introduction to dissections	-	01	-

Lectures = 01 h

A- Essential to know

Practical = 03 h

B- Good to know

Tutorials/SGD = 01/02 h

C- Nice to know

1. INTRODUCTION TO LABORATORY

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning Strategy		Duration	Department
		Teaching techniques	Learning materials		
1. Learn and practice laboratory safety measures.	Universal precautions taken in handling biological material - A Personal hygiene & protective clothing - A Do's and Don'ts in the lab – A First aid procedures to be followed in an emergency - A Proper way of cleaning and disposal of spilled chemicals – A	Practical	Practical Schedule	03 hours	Biochemistry
2. List commonly used laboratory consumables, instruments and their usage.	Basic glassware & instruments - A				
3. Explain sterilization procedures & measurement of body temperature	Lab rules, responsibilities and ethics - A Measurement of body temperature - A Sterilization techniques - A	Practical		03 hours	Physiology

2. CELL, CELL MEMBRANE & CELLULAR ENVIRONMENT

2.1. Cell

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning Strategy		Duration	Department
		Teaching techniques	Learning materials		
1. Describe basic structure and functions of an eukaryotic cell.	Structure of cell membrane - A Nucleus, sub cellular elements cytoskeleton – A	Lecture	Wheater’s Chapter –Cell structure and function	01 hour	Biochemistry
		Tutorial	CD ROM	01 hour	Anatomy
2. Explain the principles of using light & electron microscope.	Functions of the major parts of the light microscope - A Method of making simple microscopic preparations and examine them under the microscope - A	Practical	Practical schedule Wheater’s Chapter - Cell structure and function CD ROM	03 hours	Anatomy (Histology lab)
3. Explain the cells under the light microscope using the above knowledge.	Examine the main morphological features of cells as seen under the light microscope - A .				
4. Describe cell cycle and replication	Mitosis, Meiosis and Cell death – A	Lecture	Wheater’s Chapter – Cell cycle and replication CD ROM	01 hour	Anatomy

2.2 CELL MEMBRANE

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning Strategy		Duration	Department
		Teaching techniques	Learning materials		
1. Describe the basic structure of the cell membrane and relate these to the function of a cell.	Basic structure (histological and biochemical) of the cell membrane - A Functions of membrane proteins and the importance of the lipid bilayer - A				
2. List the modes of transport across the cell membrane & describe with examples the salient features of each (diffusion, osmosis, solvent drag, vesicular transport, active transport, movement of ions across ion channels).	Modes of transport across the cell membrane with examples. <u>Passive</u> - A Simple/Facilitated diffusion. Non ionic diffusion. Osmosis - Osmotic pressure Solvent drag Movement of ions across ion channels. <u>Active</u> - A Vesicular transport - endocytosis & exocytosis Primary active and secondary active - Na ⁺ / K ⁺ ATPase pump & its importance	Lecture Tutorial	Ganong's Physiology The general & cellular basis of medical physiology	01 hour 01 hour	Physiology

CELL MEMBRANE contd.

Foundation Module Phase I

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning Strategy		Duration	Department
		Teaching techniques	Learning materials		
3. Illustrate the components of the cell (sub cellular organelles) and describe their structure in relation to each organelle. Discuss how the structure is adapted to perform the function.	Illustrate the components of a cell and its histology - A Briefly explain the main functions of each organelle in a cell – A	Lecture/ Discussion	Wheater's Chapter - Cell structure and function CD ROM	01 hour	Physiology & Anatomy.
		Practical		03 hours	Anatomy (Histology)
4. Explain the features & functions of receptors & discuss the concept of up-regulation & down-regulation.	Features & functions of receptors - A Concept of up-regulation & down-regulation - A Define with examples agonist, partial agonist, antagonist, inverse agonist - A	Lecture	Handout	01 hour	Biochemistry
5. Describe the methods of intercellular communication. (paracrine, endocrine, autocrine, neural, gap junctions).	Paracrine, endocrine, autocrine, neural and communication via gap junctions with examples for each type - A	Lecture		01 hour	Physiology
6. explain the mechanisms of intracellular communication.	Mechanisms of inter / intra -cellular communication - A List the 1 st and the 2 nd messengers in intracellular communication. A				

2.3 CELLULAR ENVIRONMENT

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning Strategy		Duration	Department
		Teaching techniques	Learning Materials		
1. Describe the distribution of body fluids in to compartments. (Extra- cellular and Intracellular.)	Total body water as a percentage of body weight - A Distribution of body fluids in different compartments - A Extra-cellular – (interstitial fluid, transitional fluid) and intracellular compartments, their volumes and proportions – A	Lecture	Ganong’s Physiology The general & cellular basis of medical physiology	01 hour	Physiology
2. Describe the composition of each compartment in terms of distribution of major anions and cations and explain the similarities & differences in the composition of each compartment.	Composition of each body fluid compartment - A Differences in the composition of ECF and ICF in terms of major anions and cations (Na ⁺ , K ⁺ , Cl ⁻ , HCO ₃ ⁻ and proteins) - A				

CELLULAR ENVIRONMENT contd.

Foundation Module Phase I

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning Strategy		Duration	Department
		Teaching techniques	Learning Materials		
3. Outline the principles of measuring/calculating different body fluid compartments.	Measurable body fluid compartments - A Substances that are used to measure these fluid compartments - A Explain the method of measuring/calculating the body fluid compartment – A	Lecture	Ganong's Physiology The general & cellular basis of medical physiology	01 hour	Physiology
4. Explain the mechanism of formation of interstitial fluid.	Transport processes involved in forming body fluids and maintaining their composition - A The mechanism of formation of interstitial fluid (Starling forces) - A				

CELLULAR ENVIRONMENT contd.

Foundation Module Phase I

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning Strategy		Duration	Department
		Teaching techniques	Learning Material		
5. Outline the processes that maintain the volume, pH, composition of different body fluid compartments.	Regulation of ECF volume and composition - A Definitions of osmolality and osmolarity - A Concept of Tonicity - A Define Isotonic, Hypotonic, Hypertonic solutions with examples – A Homeostatic mechanisms that operate in electrolyte and acid base disturbances - A	Lecture	Ganong's Physiology The general & cellular basis of medical physiology	01 hour	Physiology

CELLULAR ENVIRONMENT contd.
Foundation Module Phase I

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning Strategy		Duration	Department
		Teaching techniques	Learning Materials		
6. Explain the terms pH and Buffer	Definition of pH, pH in relation to H ⁺ concentration, and how to inter convert pH & H ⁺ - A Methods of measuring pH - B Important biological role of pH - A Define the term buffer – A				
7. List the different physiological buffers and explain the important biological functions of these buffers.	Buffers of blood, urine, cytosol and intracellular fluid - A				
8. Explain the application of Henderson-Hasselbalch equation.	Henderson-Hasselbalch equation and its applications - B				
9. Define the term 'pI' and to state its uses.	Definition of 'pI' and how it can be calculated - A				

CELLULAR ENVIRONMENT contd.

Foundation Module Phase I

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning Strategy		Duration	Department
		Teaching techniques	Learning materials		
10. Outline the fluid, electrolyte & acid-base disturbances that occur in different body compartments and explain the compensatory mechanisms to maintain homeostasis.	Dehydration, overhydration, hypernatremia, hyponatremia hyperkalaemia, hypokalaemia, acidosis, alkalosis - A	Lecture Tutorial	Ganong's Physiology The general & cellular basis of medical physiology	01 hour	Physiology
11. Discuss the changes in the distribution of body fluids with age (Infants, adults and old age).	Changes in the distribution of body fluids with age - A				
12. Explain the metabolic changes in volume and composition that occur in body fluid compartments in diarrhoea & vomiting.	Volume, electrolyte & acid base changes that occur in different fluid compartments in diarrhoea & vomiting - A Importance of rehydration and the fluids used for rehydration - A			01 hour	

3. BIOMOLECULES

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning Strategy		Duration	Department
		Teaching Techniques	Learning materials		
1. List the sources and functions of inanimate molecules that are present in organisms	Sources of biomolecules e.g.	Carbohydrates	Relevant CDs		
	Carbohydrates, proteins, lipids and nucleic acids - A	-	Harper's		
	Functions of different	Lectures	1. Carbohydrates of Physiologic Significance	90 min	Biochemistry
	bio-molecules - A	Tutorial		45 min	Biochemistry
	Carbohydrate. – mono, di, oligo, and polysaccharides,	Lipids -	2. Lipids of Physiologic Significance	02 hours	Biochemistry
	glycosaminoglycans,	Lectures		45 min	Biochemistry
	proteoglycans, glycoprotein	Tutorial	3. Proteins: Structure & Function	04 hours	Biochemistry
	Amino acids, proteins	Proteins -	4. Proteins: Myoglobin & Haemoglobin	01 hour	Biochemistry
	Lipid- fatty acids, TAG	Lectures			
	phospholipids, steroids, sphingolipids, eicosanoids	Tutorial			
Nucleic acids- DNA, RNA, histones	Nucleic Acids				
	Lectures	5. Nucleic acid structure & function	90 min	Biochemistry	
	Tutorial		30 min	Biochemistry	

BIOMOLECULES Contd.

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning Strategy		Duration	Department
		Teaching Techniques	Learning materials		
<p>2. Explain the chemical and three-dimensional structures of biological molecules and assemblies, how the molecules form these structures and how the properties vary with them.</p> <p>3. Explain the structural and functional relationship of macromolecules.</p> <p>4. Explain the various forces stabilizing the macromolecules.</p>	<p>Composition, structure & different classifications and characteristic features of different Carbohydrate, Protein, Lipid and Nucleic acid as mentioned in 1 above. - B</p> <p>Differentiate: Mono, di & polysaccharides and list their functions - A</p> <p>Hydrogen, hydrophobic, electrostatic bonds and van der Waals forces (in I^{ry}, II^{ry}, III^{ry} and IV^{ry} structure of proteins and H bonds in Nucleic acids) – A</p>		<p>Lippincott's</p> <p>1. Structure of Carbohydrates</p> <p>2. Glycos - aminoglycans</p> <p>3. Glyco-proteins</p> <p>4. Fatty Acid and Tri-acylglycerol Metabolism</p> <p>5. Phospho-lipid Metabolism</p>		

BIOMOLECULES Contd.

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning Strategy		Duration	Department
		Teaching techniques	Learning materials		
<p>5. Explain that macromolecules are susceptible to external factors.</p> <p>6. Outline that changes in the structure of macromolecules can lead to various diseases.</p> <p>7. outline the principle in the qualitative and quantitative assay of macromolecules / components and them in the laboratory</p>	<p>Denaturation of proteins and factors responsible - A</p> <p>Denaturation and renaturation of DNA Blood group antigens, collagen, keratin, Mb, Hb, cell membrane functions (mainly lipids) and insulin - A</p> <p>Qualitative and quantitative estimation of amino acids and proteins, & estimation of iso- electric point unsaturation of FA, rancidity components of phospholipids structure of DNA – B</p>	<p>Practical</p>	<p>6. Structure of Proteins</p> <p>7. Globular and Fibrous Proteins</p> <p>8. DNA and RNA structure</p> <p>Handout</p>	<p>03 x 03 hours</p>	<p>Biochemistry</p>

4. ENERGY, ENZYMES AND CO FACTORS

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning strategy		Duration	Department
		Teaching techniques	Learning materials		
1. Explain how enzymes are similar and dissimilar to other catalysts.	Labile, efficient, specific, lower ΔE , activation and no change in position of equilibrium – A	Lecture	Handouts	04 hours	Biochemistry
2. Classify enzymes with examples.	Six classes and examples of each - A		References		Biochemistry
3. Explain the factors affecting rate of enzyme reactions.	pH, temperature, activators, inhibitors and enzyme concentration - A		Lippincott's Enzymes		Biochemistry
4. Draw the Michaelis-Menton and Lineweaver-Burk plots and explain the significance of constants with examples.	Effect of substrate concentration - B Significance of K_M and V_M – A Examples of competitive, non-competitive and suicide inhibition – A	Tutorial	Harper's Enzymes -General Properties	40 mins	
5. Illustrate activation and inhibition with examples of medical importance.	Lactate dehydrogenase and Creatine kinase isozymes – A	Practical		03 hours	
6. Illustrate the diagnostic value of isozymes	Characteristics of allosterism with examples – A	Fixed Learning Model	Practical Schedule		
7. Explain the principles of allosterism and covalent modification and their significance.	Covalent modification of glycogen synthase – A Effect of hormones – A				

ENERGY, ENZYMES AND CO FACTORS contd.

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning strategy		Duration	Department
		Teaching techniques	Learning materials		
8. Classify co-factors	Prosthetic groups, co-enzyme, co-substrate and metal ions – A	Lecture	Lippincott's Enzymes	01 hour	Biochemistry
		Tutorial		10 mins	
9. List high energy compounds and explain their purpose in metabolism.	ATP, NuTP, NuDP, Acetyl CoA, PEP, UDP sugars – A Driving forward unfavourable reactions, activation and participation – A	Lecture	Lippincott's Bioenergetics	01 hour	Biochemistry
		Tutorial		10 mins	

5. HISTOLOGY

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning strategy		Duration	Department
		Teaching techniques	Learning materials		
1. Describe the main morphological features of epithelial tissues, in particular those which cover surfaces or line body cavities. 2. Describe the morphological characteristics of secretory cells and glandular units.	Characteristics of epithelia. - A Classification of epithelia- A Unilaminar (simple) epithelia - A Multilaminar epithelia- A Membrane specializations of epithelia - A Glandular epithelium- A Exocrine glands – A	Lecture Histology	Wheater’s Chapter – Epithelial tissue CD ROM	01 hour	Anatomy
		Practical	Wheater’s Chapter – Epithelial tissue CD ROM	03 hours	Anatomy (Histology laboratory)
3. Describe the ultra structure of the skin.	Thick skin and thin skin - A Main layers of skin, epidermis, dermis, hypodermis or subcutis - A Skin appendages - A Skin circulation - A	Lecture	Wheater’s Chapter – skin	01 hour	Anatomy
		Practical		03 hours	Anatomy (Histology laboratory)

HISTOLOGY contd.

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning strategy		Duration	Department
		Teaching techniques	Learning materials		
4. Describe the formed elements of the supporting connective tissues. Describe the various kinds of connective tissue proper. Describe ultra structural features of connective tissue cells.	Cells of connective tissue, extra cellular matrix, fibres of connective tissue - A Classification of connective tissue. Defence cells of supporting tissue - A The reticuloendothelial concept – A	Lecture	Wheater's Chapter – Supporting/ connective tissue	01 hour	Anatomy
		Practical		03 hours	Anatomy (Histology laboratory)

6. NERVE, MUSCLE, NEUROTRANSMITTERS, SYNAPTIC TRANSMITTERS &AUTONOMIC NERVOUS SYSTEM

6.1 NERVE

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning strategy		Duration	Department
		Teaching techniques	Learning materials		
1. Describe the structure of neurone, peripheral and central nervous tissue.	Basic neurone types ultra structure of neurone - A	Lecture	Wheater’s Chapter – Nervous tissue	01 hour	Anatomy
	Myelinated and non-myelinated nerve fibres - A				
	Synapses and neuromuscular junctions – A				
	Peripheral nervous tissues - A				
	Differences between peripheral nerves and ganglia - A				
	Central nervous tissue - A				
	Differences between grey and white matter – A				
	Sensory receptors – A	Practical		03 hours	Anatomy (Histology laboratory)

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning Strategy		Duration	Department
		Teaching techniques	Learning Materials		
2. Define resting membrane potential & explain its genesis.	Ionic movement involved in the generation of resting membrane potential - A	Lecture	Ganong's Medical Physiology – Excitable Tissue: Nerve Snell's NA -The Neuron -Nerve fibres & peripheral nerves	02 hours	Physiology
3. Explain the different phases of an action potential and describe the basis of generation & conduction of action potentials.	Ionic movement in the generation of an action potential - A Method of nerve conduction - B				
4. Define relative and absolute refractory periods and explain their significance.	The significance of absolute and relative refractory periods - A				
5. Explain the effects of electrolyte imbalances of ECF on nerve excitability.	Electrolyte imbalances and its effect on nerve excitability - A				
6. Explain response to nerve injury	Denervation hypersensitivity – A Nerve degeneration & regeneration				

6.2 MUSCLE

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning Strategy		Duration	Department
		Teaching techniques	Learning materials		
1. Describe the light and electron microscopic features of smooth, cardiac and skeletal muscle tissue.	Skeletal muscle – Light microscopic appearance, basic ultra structure, sliding filament mechanism - A Cardiac muscle- Distinctive morphological features. - A Smooth muscle – Distinguishing features- A	Lecture	Wheater’s Chapter - Muscle	01 hour	Anatomy
		Practical		03 hours	Anatomy (Histology laboratory)
2. Describe the functional characteristics of the 3 types of muscles – skeletal, smooth, cardiac.	Comparison of the functions of skeletal, smooth muscle & cardiac muscles - A	Lectures	Ganong’s Medical Physiology - Excitable tissue:Muscle	02 hours	Physiology
3. Describe the physiological basis of excitation, contraction coupling of skeletal muscle.	Excitation –contraction coupling - B				
4. Compare and contrast the electrical and mechanical events occurring in the skeletal/smooth and cardiac muscle.	Electrical and mechanical events in muscles - B				

MUSCLE contd.

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning Strategy		Duration	Department
		Teaching techniques	Learning Materials		
5. Explain the structure of the neuromuscular junction and describe the chemical & electrical mechanism of synaptic transmission	Neuromuscular junction - A -chemical & electrical mechanism involved in relation to a. release of neurotransmitters b. action on motor end plate c. termination of action	Combined tutorial / PBL	Ganong's Medical Physiology - Synaptic & junctional transmission	02 hours	Anatomy & Physiology
6. Relate the above knowledge to the events that occur in Myasthenia Gravis, organophosphate poisoning and use of neuromuscular blockers.	Neuromuscular transmission in Myasthenia Gravis & organophosphate poisoning - B				

6.3 NEUROTRANSMITTERS, SYNAPTIC TRANSMITTERS & ANS

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning strategy		Duration	Department
		Teaching techniques	Learning materials		
1. Outline the structural organization of the Autonomic Nervous System	Structural components of the Autonomic Nervous system - A	Lecture	Snell NA Chapter – The autonomic nervous system	01 hour	Anatomy
2. List the main neurotransmitters in the body and describe their chemical composition (type), sites of action, mode of action and metabolism	Neurotransmitters and their - Composition - A - Site of action - A - Mode of action - A - Metabolism - B	Lecture	Ganong’s Medical Physiology -Synaptic & junctional transmission	02 hours	Physiology
3. Explain the impulse transmission, action on effectors, and the effects of stimulation and blocking of the - sympathetic nervous system - parasympathetic nervous system.	Sympathetic and parasympathetic nervous system in relation to - Transmission - A - Actions - A - Stimulation - A - Blocking - A	Fixed Learning Module Combined tutorial/PBL	Snell NA Chapter - The autonomic nervous system	02 hours	Physiology Anatomy & Physiology

7. GENERAL EMBRYOLOGY

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning Strategy		Duration	Department
		Teaching techniques	Learning Materials		
1. Understand the normal development of the human embryo and foetus. Describe the formation of early embryo and the umbilical cord, the three-layered concept.	Female gamete, Male gamete - A	Lecture IT self learning	Langmann Chapter - Gametogenesis Singh Chapter – Spermatogenesis & Oogenesis CD ROM	01 hour	Anatomy
	Union of the gametes - A Preimplantation development - A	Lecture IT self learning	Langmann Chapter – Ovulation to implantation Singh Chapter – Formation of germ layers CD ROM	01 hour	IT laboratory

GENERAL EMBRYOLOGY contd.

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning Strategy		Duration	Department
		Teaching techniques	Learning materials		
	Post implantation development – A Bilaminar germ disc – A	Lecture IT self learning	Langmann Chapter – Bilaminar germ disc Singh Chapter - Formation of germ layers CD ROM	01 hour	Anatomy IT laboratory
	Trilaminar germ disc, Derivatives of different germ layers – ectoderm, mesoderm and endoderm – A	Lecture IT self learning	Langmann Chapter – Trilaminar germ disc Singh Chapter - Formation of germ layers CD ROM	01hour 02 hours	

GENERAL EMBRYOLOGY contd.

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning Strategy		Duration	Department
		Teaching Techniques	Learning Material		
2. Understand the morphological changes which arise at the interface of embryonic and maternal and then foetal and maternal tissues. Structure of the placenta.	Cytotrophoblast, syncytiotrophoblast - A	Lecture IT self learning	Langmann Chapter Foetal membranes and placenta Singh Chapter – The placenta CD ROM	01 hour	Anatomy IT laboratory
3. Describe the formation of the axial (notochordal) process and the formation of somites.	Formation and fate of notochordal process - A Somitomes, dermatome, myotome, sclerotome - A	Lecture IT self learning	Langmann Chapter Embryonic period Singh Chapter – Further development of embryonic disc Singh Pg 46-52 CD ROM	01 hour	Anatomy IT laboratory
4. Describe briefly the external appearance during development.	Cephalocaudal folding, lateral folding, crown-rump length A	Lecture IT self learning	Langmann Chapter – Embryonic period Singh Chapter - Further development of embryonic disc CD ROM	01 hour 02 hours	Anatomy IT laboratory

8. GENETICS

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning strategy		Duration	Department
		Teaching techniques	Learning Materials		
1. Explain briefly the structure and organization of genes and chromosomes.	Genomic organization - A .	Lectures	Genetics – Structure and functions of genes, chromosome structure CD ROM	02 hours	Anatomy
2. Explain the process of duplication of DNA and Outline the functions of DNA.	DNA replication and repair Transcription and translation (with post- translational modifications) – A	Tutorial	Genetics Chapters – Mitosis, Meiosis, Sex determination CD ROM	01 hour	Anatomy
3. Explain the significance of the genetic code and Give an overview of Mendelian inheritance	Features of the genetic code and introduction to mutations A Chromosomal defects, Patterns of inheritance of dominant and recessive genes and pedigree patterns - A Multifactorial inheritance - A	Lecture	Genetics Chapters – Single gene defects, Mitochondrial inheritance CD ROM	03 hours	Anatomy

GENETICS contd.

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning Strategy		Duration	Department
		Teaching Techniques	Learning Material		
4. Discuss the human genome project and it's implications and advantages	History of the human genome project - B Goals - A Model organisms - B Public databases - B Ethical, legal and social implications - A Future consequences for medicine - B	Lecture	Handout CD ROM	01 hour	Anatomy
5. Give an overview of the principles of recombinant DNA technology	Recombinant DNA technology and its use in clinical diagnosis of genetic disorders - A .	Lecture	Genetics Pg 65-67 CD ROM	02 hours	Anatomy

9. INTRODUCTION TO DISSECTIONS

Intermediate objectives At the end of the course the learner should be able to	Content area	Learning strategy		Duration	Department
		Teaching techniques	Learning materials		
1. behave ethically in the dissection room	Appreciation of donation and respect towards the cadaver - A	Practical	Demonstrations Cunningham Volume 1 Chapter 1	03 hours	Anatomy (Dissection hall)
2. identify the different tissue planes in the body	Skin incisions - A Skin, fascia, muscle, nerves, vessels, organs and bones - A				
3. appreciate individual anatomical variations					
4. handle correctly the dissecting instruments	Scalpel, forceps, probes, gloves - A				
5. dispose material correctly	Proper disposal of dissected body parts, sharps and gloves - A				
6. maintain the dissecting cadaver in good condition	Daily application of body fluids and prevent drying of body by covering - A				

Procedural skills to be acquired

- ❖ To measure body temperature accurately.
- ❖ To detect the presence of selected Biomolecules
- ❖ To measure enzyme activity qualitatively.
- ❖ To test for denaturation of enzymes.
- ❖ To test for factors affecting the rate of enzyme reactions.
- ❖ To handle the light microscope correctly and identify different cells and tissues.
- ❖ To promote team work

Recommended reading

Biochemistry

- ❖ Lippincott's Illustrated Reviews of Biochemistry by Pamela C. Champe, Richard A. Harvey, Published by Lippincott Williams & Wilkins
- ❖ Harper's Illustrated Biochemistry by Robert K. Murray, Daryl K. Granner, Peter A. Mayes, Victor W. Rodwell, Published by Lange Medical Books/McGraw-Hill Medical Publishing Division
- ❖ Introducing Biochemistry by E.J. Wood & W.R. Pickering, Published by Irwin Publishing
- ❖ Devlin – Biochemistry With Clinical Correlations edited by Thomas M. Devlin, Published by John Wiley & Sons, Inc., Publication

Physiology

- ❖ Review of Medical Physiology by William F. Ganong, McGraw-Hill.

Gross Anatomy

- ❖ Regional and Applied Anatomy by R. J. Last, 10th edition, published by Churchill Livingstone.
- ❖ Clinical Anatomy for Medical students by Richard S. Snell, published by Lippincott Williams and Wilkins
- ❖ Gray's Anatomy, edited by Williams *et al*, 38th edition, published by Churchill Livingstone.
- ❖ Human Anatomy by B. D. Chaurasia, 4th edition, published by CBS publishers and distributors.
- ❖ Clinically oriented Anatomy by Keith L. Moore, 4th edition, published by Lippincott Williams and Wilkins.
- ❖ Grants Atlas of Anatomy by M. R. Agur, 9th edition, published by Williams and Wilkins.
- ❖ A Colour Atlas of Human Anatomy, by P. H. Abrahams *et al*, 4th edition, published by Mosby International Ltd.
- ❖ Cunningham's Manual of Practical Anatomy by G. J. Romanes, 15th edition, published by Oxford Medical Publications.

(3 volumes) (Cunningham)

Histology

- ❖ Wheater's Functional Histology by B. Young and J. W. Herath, 4th edition, published by Churchill Livingstone (Wheater's)
- ❖ Basic Histology by Luis C. Junqueira, Jose Carneiro, 10th edition, published by Lange Medical books McGraw- Hill.

Neuroanatomy

- ❖ Clinical Neuroanatomy by Richard S. Snell, 4th edition, published by Lippincott Williams and Wilkins
- ❖ Manter and Gatzs Essentials of Clinical Neuroanatomy

Embryology

- ❖ Medical Embryology by T.W. Sadler, 8th edition, published by Williams and Wilkins (Langmann's)
- ❖ Human Embryology by Inderbir Singh, G.P. Pal, 7th edition, published by Macmillan India Ltd. (Singh)

Genetics

- ❖ Basic Medical Genetics by Prof. Rohan Jayasekera (Genetics)
- ❖ Genetics, a molecular approach by T. A. Brown, 3rd edition, published by Stanley Thornes.
- ❖ Emery's Elements of Medical Genetics by Robert Mueller and Ian Young, 10th edition, published by Churchill Livingstone.

Compact Disks

- ✎ Human Anatomy Dissector
- ✎ Surface Anatomy
- ✎ The Interactive skeleton
- ✎ The Interactive Human Anatomy

Note: You are requested to read the latest edition available