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KHYBER MEDICAL UNIVERSITY

MODULE 1
FOUNDATION MODULE
1ST YEAR BDS

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Vision & Mission

Khyber Medical University (KMU) Vision:

Khyber Medical University will be the global leader in health sciences academics and research for efficient and compassionate health care.

Khyber Medical University (KMU) Mission:

Khyber Medical University aims to promote professional competence through learning and innovation for providing comprehensive quality health care to the nation.

Institute of Health Professions Education & Research (IHPER) Mission:

To produce leaders, innovators and researchers in health professions education who can apply global knowledge to resolve local issues.

Teaching Hours Allocation

Table 2: Hours allocation for different subjects

S. No	Subject	Hours
1.	Anatomy	47
2.	Oral biology (oral histology and tooth morphology)	28
3.	Physiology	24
4.	Biochemistry	24
5.	Pathology	2
6.	Pharmacology	2
7.	Community & Preventive dentistry	3
Total		**130**

Themes for Foundation Module

S#	Theme	Duration in Weeks
1.	Orientation week	1 week
2.	Basic unit of life: The Cell	1 week
3.	Development of Human body & Human Dentition	1 week
4.	Organization of Human Body & Human Dentition	2 week
Total		**5 weeks**

Learning Outcomes

By the end of this module, the students should be able to;

Cognitive Domain

1. Familiarize with BDS Curriculum.
2. Recognize the role of different disciplines in studying human body.
3. Describe the various stages of pre embryonic human development.
4. Familiarize about basic Anatomical terms (General and Oral Anatomy).
5. Recognize various developmental stages of face and oral cavity.
6. Describe the structure, function and biochemical composition of cell.
7. Describe the cell division, its types and genetic material along with its clinical correlation.
8. Describe various cellular adaptations during cell growth, differentiation and cell injury.
9. Describe the basic organization of human body.
10. Explain the maintenance of homeostatic mechanism.
11. Describe the importance of buffer and PH system.

Psychomotor Domain

1. Perform the basic laboratory techniques and use of microscope.
2. Display steps of sterilization and disinfection.
3. Prepare assignment on MS office individually and in team.

Affective Domain

1. Follow the standard operating procedures of lab.
2. Follow preventive and safety measures in dental practices.
3. Participate individually and in team work efficiently.
4. Maintain discipline of the college.
5. Follow the norms of the college properly.

Theme I: Orientation Week

(White Coat Ceremony+ Departmental Visits)

1.	White coat ceremony (Day-01 Activity)
	Departmental visits (Day-02- 05)
2.	Visit to Basic Medical Sciences Departments (DME, Anatomy, Physiology, Biochemistry, Pathology, Pharmacology, Library, Digital Library, SAS, Hostels).
3.	Visit to Basic Dental Sciences Departments (Oral Biology, Science of Dental Materials, Oral Pathology, Community Dentistry, Phantom- Head Lab).
4.	Visit to Clinical Dental/ Medical Departments (Operative Dentistry, Periodontology, Orthodontics, Prosthodontics, Oral & Maxillofacial Surgery, Oral Medicine, Oral Radiology, Paediatric Dentistry, Diagnostic Department, General Medicine, and General Surgery).
5.	Introductory Lectures (Refer to Table of Specification below)

TABLE OF SPECIFICATION

Subject	Topic	Hours	Learning objectives
Anatomy	Anatomy and its sub-branches	1 hour	1. Define anatomy and its branches. 2. Describe purpose of study of anatomy and its branches.
Physiology	Physiology and its sub branches	1 hour	3. Define physiology and enumerate its branches. 4. Discuss human physiology and its sub branches. 5. Discuss functional organization of human body.
Biochemistry	Introduction to biochemistry	3 hour	6. Define biochemistry. 7. Discuss the role of biochemistry in dentistry. 8. Discuss biochemistry of the cell. 9. Discuss carbohydrates, proteins, biological membrane. 10. Discuss vitamins, mineral & trace elements.
Pathology	Introduction to pathology	1 hour	11. Define pathology. 12. Enumerate the different branches of pathology. 13. Identify different sampling and processing techniques in different branches of pathology.
Pharmacology	Intro to pharmacology	1 hour	14. Define pharmacology and its role in patient care.
Oral Biology	Introduction to oral histology and tooth morphology	1 hour	15. Define oral biology and its branches. 16. Define tooth morphology. 17. Recognize Anatomic and physiologic consideration of form and function of oro-dento-facial structures.
Community & Preventive Dentistry	Introduction to community dentistry and dental health	1 hour	18. Define public health, health and dental public health. 19. Enlist tools of public health. 20. Discuss the scope of dental public health. 21. Explain history of dental public health.

Medical Education	Curriculum structure Teaching learning strategies	1 hour	22. Discuss the curriculum and modules. 23. Describe the use of study guides. (not to be assessed) 24. Differentiate between various teaching & learning strategies. 25. Enlist various assessment tools & assessment policy. 26. Explain the role of teacher. 27. Discuss the responsibilities of the student. 28. Apply Study skills.
	Role of Regulatory Bodies (PMDC And HEC)	1 hour	29. Describe the structure and functions of Pakistan Medical and Dental Council (PM&DC). 31. Discuss the role of World Federation Medical Education (WFME). 30. Describe the structure and functions of Higher Education Commission (HEC). 31. Describe the role of Higher Education Commission (HEC). 32. Discuss the relevant policies related to educational institutes. e.g., policy on protection against sexual harassment in higher education institutions, policy on drug and tobacco abuse in higher education institutions etc.
Self-Learning Resource Centre (SLRC)	Importance of IT skills	1 hour	33. Define IT and its importance. 34. Introduction to library/e-library. 35. Intro to AI tools in academics and research. 36. Discuss policy of institute regarding social media usage.
	MS word skills PowerPoint skills Excel sheet	1 hour	37. Prepare the assignment on MS word with insertion of tables and flowchart. 38. Prepare the presentation on power point. 39. Draw tables on the excel sheet using formulas.

Theme II: Basic Unit of Life: The Cell

Subject	Topic	Hours	Learning Outcomes
Histology	Histological concepts of cell	1 hour	40. Describe the cell as a living unit of body. 41. Describe the structure of cell and its organelles. 42. Describe the structure of cytoplasmic organelles of the cell & correlate it with their functions.
	Nuclear structure & components	1 hour	43. Describe the structure of the nucleus, nucleolus & chromosome and their functions in cell integrity.
	Cell junction	1 hour	44. Define cell junction. 45. Describe the structure and functions of the junctions. 46. Discuss the junctions on the basal and lateral surfaces of the cell. 47. Enlist the junctional complex.
Embryology	Cell division Mitosis and meiosis	2 hour	48. Explain the process of cell division. 49. Describe mitotic cell division with its stages.
			50. Explain the process of Meiosis. 51. Explain the non-disjunction of chromosomes. 52. Correlate the process of non-disjunction with chromosomal abnormalities.
Oral Biology	Tooth structures & cells of oral cavity	1 hour	53. Define and recognize tooth structures. 54. Identify different cells in the oral cavity.

Physiology	Cell Membrane	1 hour	55. Discuss the structural organization of cell membrane. 56. Explain the functions lipids and proteins of cell membrane. 57. State the significance of glycocalyx of cell membrane.
	Cytoplasmic Organelles	2 hours	58. Enlist cytoplasmic organelles. 59. Discuss the functions of ribosomes, endoplasmic reticulum, golgi bodies, mitochondria, cytoskeleton, lysosomes and peroxisomes. 60. State the functions of different types of cytoskeleton. 61. Explain the mechanism of endocytosis: Pinocytosis and Phagocytosis. 62. State the steps of Phagocytosis.
	Locomotion of the cell	1 hour	63. Enlist the types of cellular movements. 64. Discuss the mechanism of ameboid locomotion. 65. Discuss ciliary movement of the cell.
	Transport across Cell Membrane	2 hours	66. Differentiate between diffusion and active transport. 67. Discuss diffusion of lipid soluble substances through cell membrane. 68. Discuss diffusion of water soluble substances through protein channels. 69. Explain the mechanism of facilitated diffusion. 70. Explain the graph showing differentiation between simple and facilitated diffusion. 71. Discuss the mechanism of active transport across the cell membrane. 72. Differentiate between primary and secondary active transport.
	Membrane Potentials & Action Potentials	2 hours	73. Define membrane potential and explain its mechanism. 74. Discuss the resting membrane potential in neuronal cell. 75. Describe ionic conc. differences across cell membrane. 76. Explain the Nernst equation. 77. Explain origin of normal resting membrane potential. 78. Explain action potential in neuronal cell and its stages. 79. Explain the role of voltage gated Na+ and K+ channels in action potentials.

			80. Discuss the changes in conductance of Na and K channels with changes in membrane potentials. 81. Discuss “All-or-nothing” Principle.
Biochemistry	Biochemical structure of cell and its organelles	1 hours	82. Explain the Bio-chemical composition of cell organelles and cytoplasm. 83. Describe the chemical structure of cytosol. 84. Describe the chemical structure and importance of mitochondrial membrane.
	Nucleus	2 hours	85. Describe Bio-chemical structure of nuclear membrane and its functions. 86. Define and explain nucleotides and nucleosides. 87. Describe the components of nucleotides. 88. Describe the functions of Nucleotides. 89. Describe the types of nucleic acids. 90. Differentiate between RNA and DNA. 91. Describe the Structure of nucleic acids. 92. Describe biochemical functions.
	Cell transport mechanism	1 hour	93. Explain membrane transport. 94. Discuss passive diffusion, active transport, and facilitated transport via a channel or carrier.

			95. Describe and evaluate the role of ion gradients, co transporters, and ATP in active transport mechanisms.
Pathology	Cell injury	1 hour	96. Enumerate the various causes of cell injury. 97. Describe the response of a normal cell to stimuli. 98. Describe the mechanisms of cell injury. 99. Enumerate the different types of cellular adaptations.
Pharmacology	Routes of administration of drugs Drug distribution and bioequivalence Receptor and cellular basis	1 hour	100. Enlist the route of administration of a drug. 101. Explain how drugs are transported across cell membrane and factors affecting it. 102. Describe different types of drug receptors and enzyme inhibition as a mechanism of action of drugs.
Lab Work			
Physiology Practical	Microscope Lab equipment and Techniques	2 hours	103. Identify the parts of microscope. 104. Demonstrate the operation of microscope. 105. Demonstrate the focusing of slide on microscope using different powers and magnifications. • Identify the equipment used in Labs • Follow SOPs (standard operating protocols) • Display safety measures in performing lab techniques 106. Display methods of sterilization and disinfection.
Oral biology & Tooth Morphology	Introduction to oral biology & Tooth Morphology	2 hours	107. Recognize the tooth structures. 108. Identify different cells in the oral cavity.
Community & Preventive Dentistry	Cross infection control	2 hours	109. Demonstrate hand washing technique. 110. Demonstrate use of Personal Protective Equipment.

Theme III: Development of Human Body & Human Dentition			
Subject	**Contents**	**Hours**	**Learning Outcomes**
Embryology	Introduction to Embryology	1 hour	111. Discuss embryologic terminology. 112. Explain significance of embryology.
	Gametogenesis	1 hour	113. Describe the process of Gametogenesis. 114. Enlist the differences between spermiogenesis and spermatogenesis 115. Describe the morphological changes during maturation of gametes. 116. Describe oogenesis and its correlation with meiosis. 117. Compare oogenesis and spermatogenesis.
	Female reproductive cycle	1 hour	118. Describe the ovarian cycle. 119. Discuss the process of follicular development. 120. Explain the process of ovulation. 121. Correlate with the phases of menstrual cycle
	Fertilization	1 hour	122. Define fertilization. 123. Describe the process of fertilization. 124. Describe the outcome of fertilization.
	First week development Cleavage & Blastocyst Formation	1 hour	125. Describe the process of cleavage of zygote. 126. Discuss the formation of blastocyst. 127. Summarize the events of first week of development normal and abnormal.
	Bilaminar Germ Disc	1 hour	128. Describe the formation of amniotic cavity. 129. Discuss the development of embryonic disc 130. Explain the development of Chorionic sac.

	3rd week of development.	3 hours	131. Describe Formation of three germ layers. ○ Derivatives of Ectoderm. ○ Derivatives of Mesoderm(A. Paraxial mesoderm,B. Intermediate mesoderm, C. Lateral plate mesoderm.) ○ Derivatives of endoderm
	3rd to 8th week the embryonic period 4th to 8th week of development.	2 hours	132. Describe the formation of different organo-genetic period with a process of folding. 133. Define fetal period. 134. Enlist the important changes that occur during the fetal period. 135. Enumerate the factors affecting the fetal period.
	Third month to birth: The fetus and placenta fetal membrane	2 hours	136. Describe str.of placenta. 137. Describe chorionic frondosum and decidua basalis. 138. Discuss fetal membranes in twins. 139. Describe parturition. 140. Enlist the development of different types of fetal membranes. 141. Describe the formation and function of amniotic fluid. 142. Enumerate teratogens. 143. Describe the effects of teratogens on fetus.

Biochemistry	Carbohydrates	1 hours	145. Explain carbohydrate and its Bio-chemical structure. 146. Classify carbohydrate and give their Bio-chemical importance. 147. Relate the structure of polysaccharides with its clinical importance. 148. List the functions of carbohydrates in cell membrane, energy provision and nutrition supply to different parts of body. 149. Describe the different isomers of monosaccharides Galactose, mannose, fructose, dextrose. 150. Describe the role of dextrose in I/V infusion. 151. Describe the role of mannitol in cerebral edema. 152. Describe the structure of disaccharides and oligosaccharides.
	Polysaccharides Monosaccharide's	1 hour	153. Define and discuss Polysaccharides. 154. Discuss structures and types of Polysaccharides. 155. Define Monosaccharide's. 156. Discuss structure and types.
	Reducing and non-reducing Sugars	1 hour	157. Define reducing sugars, types. 158. Discuss the structure and types of reducing sugars.
Physiology	Homeostasis	1 hour	159. Differences between extra and intracellular fluids. 160. Discuss the mechanism of homeostasis. 161. Describe the origin of nutrients in extracellular fluid
	Control system of the body	1 hour	162. Explain control mechanisms of the body with examples. 163. Discuss the characteristics of control system: Negative and positive feedback mechanisms.
Oral biology	Tooth development	3hours	164. Discuss the stages of tooth development. 165. Discuss the cells involved in tooth development. 166. Explain single and multiple root formation. 167. Discuss clinic consideration.

Lab Work			
Physiology Practical	Capillary blood sampling	2 hours	168. Identify the sites for obtaining blood sample with different methods and discuss the indication for their use. 169. Obtain capillary blood sample for hematological investigation through prick method.
	Separation of Blood & Plasma by Centrifuge method	2 hours	170. Demonstrate the correct use of a centrifuge machine to separate blood components into plasma and cellular fractions. 171. Demonstrate the step-by-step process of preparing a blood sample for centrifugation, including proper handling and labeling.
Biochemistry Practical	Detection of Monosaccharide in a given Solution	4 hours	172. Perform test for detection of glucose. 173. Perform test for detection of fructose. 174. Perform test for detection of galactose. 175. Perform test for detection of lactose.
	Detection of unknown sugar in a solution	2 hours	176. Perform the test for unknown sugar in a solution.
	Detecting of Reducing and non-reducing Sugars	2 hours	177. Perform test for detection of maltose. 178. Perform test for detection of sucrose.
Oral biology	Tooth development	3hours	179. Identify the stages of tooth development. 180. Recognize the cells involved in tooth development. 181. Identify single and multiple root formation.

Theme IV: Organization of Human Body & Human Dentition			
Subject	**Topic**	**Hours**	**Learning Outcomes**
Anatomy	Anatomical terms	1 hour	182. Describe the anatomical terms for planes, position, and movements.
	General anatomy of bones cartilage and joints	1 hour	183. Describe the structure and function of bone. 184. Classify bones on the basis of length and shape. 185. Identify the markings on bone.
		1 hour	186. Describe cartilage. 187. Classify the types of cartilage. 188. Describe the types of cartilages.
		1 hour	189. Classify joints on the basis of structure. 190. Describe the mechanism of movements of joint.
	Muscles	1 hour	191. Describe various muscle types along with structure.
	Connective tissue	3 hour	192. Explain different cells of connective tissue. 193. Describe composition of the ground substance. 194. Describe components of connective tissues. 195. Discuss loose and dense connective tissue.
	Integumentary system Skin	2 hours	196. Describe layers of epidermis and dermis 197. Discuss skin creases, Nails, Hairs, Glands (Sebaceous & sweat) 198. Discuss the anatomical structures of Skin / Integumentary system.
	General anatomy of circulatory system	1 hour	199. Describe Various types of Arteries and veins. 200. Describe capillaries.

	Lymphatic system	1 hour	201. Describe organization of the lymphatic system. 202. Explain the functions of lymphatic system. 203. Explain the mechanisms for the movement of lymph in the body. 204. Identify lymph nodes of head and neck.
	Nervous system Divisions (central & peripheral and somatic & autonomic)	1 hour	205. Define the organization of nervous system. 206. Describe the divisions of nervous system. 207. Describe the formation of spinal nerve and concept of dermatome and myotome. 208. Describe the formation of nerve plexus.
Anatomy		1 hour	209. Describe the organization of autonomic nervous system. 230. Differentiate between sympathetic and parasympathetic nervous system on the basis of structure.
	Membranes: Fascia, ligaments and raphe	1 hour	231. Describe the structure of membranes of human body. 232. Describe the anatomy and significance of fascia, ligaments and raphe.
Maxillofacial surgery	Radiological anatomy in dentistry (PA, OPG, CEPH, PNS)	1 hour	233. Identify various anatomical landmarks on radiograph. 234. Describe commonly used radiographs. 235. Describe various view used for obtaining radiographs.

Physiology	Organization of nervous system: Structure of Neuron, Hormones and their functions	2 hour	236. Describe the structure of neuron. 237. Discuss major levels of CNS functions. 238. Define and classify hormone. 239. Describe the synthesis, secretion and transport of hormones in the body. 240. Discuss the mechanism of action of hormones.
	Synapse, its types and synaptic transmitters	2 hours	241. Enlist the types of synapses: Chemical and electrical. 242. Discuss physiological anatomy synapse. 243. Enlist chemical substances that function as synaptic transmitter. 244. Describe the electrical events during neuronal excitation and inhibition.
	Autonomic nervous system	2 hours	245. Discuss general organization of autonomic nervous system. 246. Compare and contrast the functions of sympathetic and parasympathetic nervous system. 247. Classify autonomic receptors and their types. 248. Explain the autonomic effects on various organs of the body.
Histology	Basic Body tissue	1 hour	249. Define tissue. 250. Describe the basic tissues in human body. Definition of tissue i. Epithelial tissue ii. Connective tissue iii. Muscular tissue iv. Nervous tissue
	Epithelial tissues	2 hours	251. Define epithelium. 252. Classify epithelium. 253. Describe the general features of epithelium. 254. Explain the specialized functions of different types of epithelial cells. 255. Describe the structure of main types of cell junctions. 256. Describe the surface specialization of epithelia. 257. Correlate their structure, with their location and function.

	Glandular Epithelium	1 hour	258. Enlist glandular epithelia. 259. Classify them on the basis of morphology, nature of secretion and mode of secretion. 260. Differentiate between exocrine & endocrine glands on the basis of structure and function.
	Basement Membrane	1 hour	261. Describe the structure of the basement membrane & correlate it with its function.
	Bone	1 hour	262. Enumerate different cells of bone tissue. 263. Describe histological structure of bone. 264. Classify bone on the basis of histological feature.
Oral Biology	Enamel	6 hours	265. Discuss the organic and inorganic composition of enamel. 266. Explain enamel crystallites, rods, orientation, and their strength. 267. Discuss histological structures of enamel, their significance. 268. Differentiate enamel spindle, tufts, and lamellae. 269. Define and discuss significance of dentin enamel junction. 270. Describe life cycle of Ameloblast with theoretical background of each stage. 271. Interpret amelogenesis including matrix formation and mineralization. 272. Enlist enamel proteins and their role in amelogenesis. 273. Discuss Defects of development and amelogenesis including
Biochemistry	Chemistry of Acids and Bases	1 hour	274. Define acids, bases, strong acids, and weak acids. 275. List different types and sources of acids and bases in our body.

	Buffers	1 hour	276. Describe the mechanism of their normal balance and biochemical importance. 277. Explain PH of acids Buffer pairs. 278. Define Buffer and its role in maintenance of body PH. 279. Differentiate between good chemical and physiologic buffers Intracellular and extra cellular buffers, chemical buffers of plasma, chemical buffers of urine. 280. Explain Mechanism of Acidosis and alkalosis and compensation. 281. Define colloidal state and Henderson Hasselbalch equation.
	Solutions	1 hour	282. Define normal solution. 283. Define standard solution.
Oral Biology	Introduction To tooth morphology/ nomenclature	3 hours	284. Classify human dentition on the basis of types of teeth and sets of dentitions. 285. Define dental formula. 286. Indicate sequence and age of eruption of teeth. 287. Describe numbering system (FDI, universal and palmer notation system. 288. Describe various morphological structures on tooth surfaces 289. Enumerate line and point angles of anterior and posterior teeth. 290. Describe various morphological on tooth surfaces.
	Anatomic and Physiologic considerations	2 hours	291. Discuss number and significance of lobes in permanent teeth. 292. Define and discuss inter-proximal spaces, contact areas, embrasures, cervical line and height of contour. 293. Describe crown surface form in terms of general shape and its significance to specific function of tooth.

	of form and function of teeth		294. Describe proper location and form of marginal ridges and facial line angles and their relationship to embrasure form. 295. Identify the number, length and distribution of roots and their influence on tooth form and function of both anterior and posterior teeth.
Lab Work			
Histology	Tissue Processing	2 hours	296. Demonstrate the process of tissue processing for histo-pathological examination.
	H& E staining		297. Perform H & E staining of tissue slides under supervision in the laboratory.
	Epithelia	2 hours	298. Identify and describe simple epithelia under Microscope. 299. Identify different types of epithelia based on histological features under Microscope such as simple squamous epithelium, simple cuboidal, simple columnar, pseudostratified columnar, stratified squamous, stratified cuboidal, stratified columnar, transitional epithelium.
	Cartilage	1 Hour	300. Differentiate different types of cartilages based on histological structure such as Hyaline cartilage, Fibrocartilage, Elastic cartilage.
	Bone	1 Hour	301. Differentiate different types of bones based on histological structure such as compact bone and spongy bone.
	Muscles	2 hours	302. Identify the histological features of skeletal, cardiac and smooth muscles.
Biochemistry	Solutions	2 hours	303. Prepare of 0.9% NaCl. 304. Measure the PH of given solution.
	Examination instruments	1 hour	340. Identification and handling of examination instruments.
	Ergonomics		341. Define dental ergonomics. 342. Discuss importance of ergonomics in dentistry.

			343. Discuss the posture of dentist in sitting and standing position with respect to the patient and unit. 344. Discuss position of dental assistant. 345. Describe ergonomics of 4 handed dentistry. 346. Enumerate ergonomics hazards.
Tooth Morphology	Introduction to tooth morphology/ nomenclature	2 hours	347. Identify on tooth models/images different morphological structures present on tooth surface. 348. Draw and label the diagram of all tooth surfaces (anterior and posterior teeth).
	Enamel	4 hours	349. Identify the organic and inorganic composition of enamel. 350. Recognize enamel crystallites, rods, orientation, and their strength. 351. Identify histological structures of enamel, their significance. 352. Differentiate enamel spindle, tufts, and lamellae. 353. Identify the dentine enamel junction.
Physiology	Introduction to Neubar's chamber	2 hours	354. Demonstrate Neubar's chamber and its components. 355. Apply the principles of cell counting to accurately determine the number of cells per unit volume using a Neubar's chamber. 356. Interpret the grid layout of a Neubar's chamber to identify and count cells in the correct regions.