



MODULE 3

CRANIOFACIAL 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

S. No	Subject	Hours
1.	Anatomy Histology = 9 Embryology = 1 Gross Anatomy = 41 Neuroanatomy = 28	79
2.	Oral Biology & Tooth Morphology	54
3.	Physiology	27
4.	Biochemistry	10
5.	Community & Preventive Dentistry	1
6.	Oral Medicine	1
Total		172

Themes

S. No	Theme	Duration in Weeks (hrs)
1.	Orofacial Pain	1 (32hrs)
2.	Cranio-facial injury	2 (72hrs)
3.	Facial Paralysis	1 (24hrs)
4.	Sore Mouth	1.5 (47hrs)
5	Dental Caries	2 (66hrs)
6	Swollen Eye	1 (32hrs)
7	Nose Bleed	1 (24hrs)
Total		9 weeks (297)

Learning Objectives

By the end of this Module, 1st year BDS students will be able to:

1. Describe the histology, structure, biochemical properties, function, and pathologies of bones and muscles in the cranium and face.
2. Describe the histology, anatomical structures, biochemical properties, and functions of the cranium.
3. Describe the development and anatomical structures of the face.
4. Discuss the overview of Trigeminal Neuralgia and Bell's Palsy.
5. Discuss the structure and features of maxillary central and lateral incisors, maxillary pre-molars, and maxillary canines.
6. Discuss the structure and features of mandibular central and lateral incisors and mandibular canines.
7. Describe the development, histology, functions, and different structures of the oral cavity.
8. Discuss an overview of common dental diseases such as caries, plaque, and calculus.
9. Describe the development, histology, structure, and function of the orbit and eye.
10. Describe the development, histology, structure, and function of the nose and paranasal sinuses.

Theme 1: Orofacial pain

Subject	Topic	Hours	Learning Objectives
Histology	Cartilage	1hr	<ol style="list-style-type: none"> 1. Define cartilage. 2. Describe components of cartilage. 3. Describe histological characteristics of cartilage. 4. Classify cartilage on basis of histological features.
	Muscular Tissue	1hr	<ol style="list-style-type: none"> 5. Describe histological features of skeletal muscles.
Oral Biology & Tooth Morphology	Bone	3hrs	<ol style="list-style-type: none"> 6. Discuss osteoblast stimulator and hormones involved in bone metabolism. 7. Discuss osteoclast morphology and mechanism of bone resorption and deposition with its clinical significance. 8. Describe methods of bone formation. 9. Briefly explain growth of bones and bone remodeling. 10. Enumerate serum markers of bone remodeling. 11. Describe structure of alveolar bone with its functions. 12. Discuss types and formation of alveolar bone. 13. Discuss age related changes of bone.

	Maxillary and Mandibular Central & Lateral Incisors	4hrs	<p>14. Explain the morphology of labial, lingual, mesial, distal, and incisal, aspects of crown of maxillary central and lateral incisors.</p> <p>15. Explain morphology of root of both incisors.</p> <p>16. Explain variations and anomalies associated with maxillary central and lateral incisors.</p> <p>17. Explain variations and anomalies associated with maxillary central and lateral incisors.</p> <p>18. Explain the morphology of labial, lingual, mesial, distal, and incisal, aspects of crown of mandibular central and lateral incisors.</p> <p>19. Explain morphology of root of both incisors.</p> <p>20. Explain variations and anomalies associated with mandibular central and lateral incisors.</p> <p>21. Explain variations and anomalies associated with mandibular central and lateral incisors.</p> <p>22. Differentiate between maxillary and mandibular incisors</p>
Anatomy	Parathyroid Gland	1hr	<p>23. Describe gross and histological features of parathyroid gland.</p> <p>24. Describe blood supply of Parathyroid gland.</p> <p>25. Describe nerve supply of Parathyroid gland.</p>
	Trigeminal Nerve and Ganglion	2hrs	<p>26. Explain the origin, course, and enumerate the main divisions of the trigeminal nerve.</p> <p>27. Describe location and relations of Trigeminal Ganglion (TG).</p> <p>28. Enumerate roots and branches of TG.</p> <p>29. Describe blood supply of TG.</p> <p>30. Define trigeminal neuralgia.</p>

Physiology	Bone Metabolism	1hr	31. Describe the effect of parathyroid hormone on calcium and phosphate concentrations in the extracellular fluid. 32. Explain the control of parathyroid secretion by calcium ion concentration.
	Growth Hormone	1hr	33. Describe the actions of calcitonin. 34. Explain the pathophysiology of parathyroid hormone, vitamin D, and bone diseases. 35. Discuss the functions of growth hormone and its effects on bone and cartilage.
	Physiology of Muscles	1hr	36. Enlist the type of muscles. 37. Discuss the basic physiological structure and function of skeletal muscle.
	Neuromuscular Junction	1hr	38. Draw and label neuromuscular junction. 39. Describe the structure of Actin and myosin. 40. Enlist the function of their subunits. 41. Discuss the sequence of events taking place during neuromuscular transmission and factors affecting it.
	Muscle Contraction	1hr	42. Describe the general mechanism of muscle contraction. 43. Define Excitation of skeletal muscle. 44. Discuss Neuromuscular Transmission and Excitation-Contraction Coupling.
Biochemistry	Role of Vitamin D In Bone Metabolism	1hr	45. Discuss the role of vitamin D. 46. Describe the effect of vitamin D in calcium absorption and in bone mineralization. 47. Discuss the impact of vitamin D deficiency on bones.

	Role of GAGS	1hr	48. Discuss the role of GAGS in formation of connective tissues, cartilage, bones, and tendons.
	Role of Proteins	1hr	49. Describe the chemical structure of cellular matrix of collagen and elastin.
	Role of vitamin B1, sodium and potassium	1hr	50. Discuss the role of B1 as TPP in transmission of nerve impulse and acetylcholine synthesis. 51. Discuss the role of sodium and potassium in the transmission of nerve impulse.
	Prostaglandins	1hr	52. Discuss synthesis and functions of prostaglandins and pain management.
Lab Work			
Oral Biology & Tooth Morphology	Maxillary & Mandibular Central & Lateral Incisors	6hrs	53. Identify on tooth models/specimens or images labial depressions, imbrication lines, height of contour, cingulum, lingual fossa, marginal ridges, incisal edge. 54. Draw and label maxillary central and lateral incisors. 55. Draw and label mandibular central and lateral incisors.
Histology	Muscular Tissue	2hrs	56. Identify the histological features of skeletal muscles.
	Parathyroid Gland	2hrs	57. Identify the histological features of Parathyroid gland.

Theme 2: Head Injury

Embryology	Cranium	1hr	58. Describe the development of skull.
Gross Anatomy	Norma Frontalis (5 th)	2hrs	59. Identify the skeletal features of norma frontalis (including Zygoma, Maxilla, and Mandible). 60. Describe muscle attachments. 61. Enlist structures passing through foramina. 62. Enumerate relevant clinical problems of Norma frontalis.
	Norma Basalis (3 rd)	3hrs	63. Discuss the anterior cranial fossa, middle and posterior cranial fossa. 64. Describe muscle attachments. 65. Enlist structures passing through foramina.
	Norma Lateralis (4 th)	3hrs	66. Identify the skeletal features of Norma lateralis. 67. Describe muscle attachments. 68. Enlist structures passing through foramina. 69. Enumerate relevant clinical problems of norma lateralis. 70. Discuss temporal fossa, infra-temporal fossa, and pterygopalatine fossa.
	Norma Occipitalis (2 nd)	1hr	71. Identify the skeletal features of norma occipitalis. 72. Describe muscle attachments. 73. Describe emissary veins of skull.
	Norma Verticalis (1 st sequence)	1hr	74. Identify the skeletal features of norma verticalis. 75. Enumerate relevant clinical problems of norma verticalis.
Neuroanatomy	Neuron	1hr	76. Define neuron. 77. Enumerate the supporting cells of nervous tissue. 78. Describe the structure of multi-polar neuron. 79. Classify neurons on the basis of morphology, function, and length.

Meninges	1hr	<p>80. Explain structural features of meninges.</p> <p>81. Describe blood supply of meninges.</p> <p>82. Describe nerve supply of meninges.</p> <p>83. Enumerate relevant clinical problems of structures of cranial cavity (e.g., headache, extradural and subdural hemorrhage etc.).</p> <p>84. Enlist paired and unpaired venous sinuses of dura matter.</p>
Dural Venous Sinuses	1hr	<p>85. Enlist paired and unpaired venous sinuses of dura matter</p> <p>86. Identify various folds of the dura mater on a model</p> <p>87. Describe relations, tributaries, and drainage of venous sinuses</p> <p>88. Enumerate relevant clinical problems of venous sinuses (e.g., thrombosis of cavernous sinus, sigmoid and super sagittal sinus pulsating exophthalmos etc.).</p> <p>89. Relate connection of emissary veins with sinuses.</p>
Hypophysis Cerebri	1hr	<p>90. Describe relations of hypophysis cerebri.</p> <p>91. Describe parts of hypophysis cerebri.</p> <p>92. Describe blood supply of hypophysis cerebri.</p> <p>93. Briefly explain hypothalamus-hypophyseal portal system.</p>
Cranial Nerves	1hr	<p>94. Enlist cranial nerves.</p> <p>95. Classify cranial nerves according to their functions.</p>
Middle Meningeal Artery	1hr	<p>96. Explain course and relations of middle meningeal artery.</p> <p>97. Enlist branches of middle meningeal artery.</p> <p>98. Discuss clinical relevance of extradural hemorrhage with middle meningeal artery.</p>

	Cerebrum Cerebral Cortex	1hr	99. Identify all the lobes of the brain. 100. Explain the detail of the cerebral hemisphere including internal structures. 101. Identify the location of the cortical areas. 102. Explain the functions of all the important cortical areas.
	Cerebellum	1hr	103. Describe the gross anatomy of the cerebellum. 104. Describe the blood supply of the cerebellum. 105. Discuss the connections and functions of cerebellum.
	Thalamus	1hr	106. Enumerate all the important nuclei of the thalamus and their functions. 107. Identify gross structures of the thalamus. 108. Discuss the connections of thalamus.
	Basal Nuclei (Ganglia)	1hr	109. Enumerate the basal nuclei and its most important structures. 110. Recall the important functions of the basal nuclei along with their clinical correlations.
	Hypothalamus	1hr	111. Enumerate the nuclei and their functions of the hypothalamus. 112. Discuss the connections of hypothalamus.
	Limbic System	1hr	113. Describe components of limbic system.
	Circle of Willis	1hr	114. Describe structure of circle of Willis. 115. Describe supply by circle of Willis to various structures.
	Ventricular System of the Brain	2hrs	116. Describe anatomy of Ventricular system of the brain. 117. Describe pathway of ventricular system.
Histology	Cerebral Cortex	1hr	118. Enumerate different histological layers of cerebral cortex.
	Cerebellar Cortex	1hr	119. Enumerate different histological layers of cerebellar cortex.

Physiology	Pituitary Gland	2hrs	<p>120. Explain the pituitary gland and its relation to hypothalamus.</p> <p>121. Discuss Pituitary hormones and their control by hypothalamus.</p> <p>122. Summarize the hypothalamic hypophysial portal blood vessels of the anterior pituitary gland and its significance.</p>
	Cerebral Cortex	5hrs	<p>123. Describe the association areas of cerebral cortex.</p> <p>124. Explain the functions of association areas.</p> <p>125. Interpret the function of the posterior superior temporal lobe Wernicke's Area.</p> <p>126. Discuss the concept of the dominant hemisphere.</p> <p>127. Enlist the Functions of the parieto-occipitotemporal cortex in the non-dominant hemisphere.</p> <p>128. Discuss higher intellectual functions of prefrontal association areas</p> <p>129. Define memory.</p> <p>130. Classify the types of memory.</p> <p>131. Explain consolidation of memory.</p> <p>132. Discuss the Retrograde Amnesia.</p>
	Limbic System	1hr	<p>133. Explain the functions of the limbic cortex.</p> <p>134. Discuss the behavioral functions of the hypothalamus and associated limbic structures.</p>
	Hypothalamus	1hr	<p>135. Discuss the role of hypothalamus as major control headquarter for the limbic system.</p>
	Basal Ganglia	2hrs	<p>136. Describe the physiological classification and functional circuits of basal ganglia.</p> <p>137. Explain in detail the basal ganglia and their motor functions.</p> <p>138. Describe connections of putamen and caudate circuits.</p>

			139. Introduce the clinical relevance of basal ganglia.
	Cerebral Blood Flow/ CSF	2hrs	140. Describe the regulation of cerebral blood flow. 141. Explain in detail the production, rate of flow and absorption of CSF. 142. Discuss the cushioning function of the cerebrospinal fluid. 143. Explain the cerebrospinal fluid pressure. 144. Define blood brain barriers.
	States Of Brain Activity	2hrs	145. Describe brain waves and clinical significance of EEG. 146. Define sleep with its theories. 147. Describe the physiologic effects of Sleep 148. Enlist sleep neurotransmitters and sleep disorders.
Biochemistry	Synthesis of Neuro Transmitters	2hrs	149. Define the characteristics of neurotransmitters. 150. Enlist neurotransmitters involved in central nervous tissues. 151. Explain the role of amino acid (tyrosine, glutamate, and tryptophan) in biosynthesis of neurotransmitters. 152. Discuss the role of vitamin B6 (pyridoxine) in decarboxylation of certain amines to produce neurotransmitters.
Lab Work			
Anatomy	Norma Basalis (3rd)	2hrs	153. Demonstrate surface markings of different structures on skull model. 154. Identify the structures present in: <ul style="list-style-type: none"> • Anterior Cranial fossa. • Middle Cranial fossa. • Posterior Cranial fossa.
	Norma Lateralis (4 th)	2hrs	155. Demonstrate surface markings of different structures in skull model.
	Norma Occipitalis (2 nd)	2hrs	156. Demonstrate surface markings of different structures in skull model.

	Norma Verticalis (1 st)	2hrs	157. Demonstrate surface markings of different structures in skull model.
Neuroanatomy	Meninges	2hrs	158. Identify various folds of the dura mater on a model.
	Cranial Nerves	2hrs	159. Identify the site of origin of cranial nerves.
	Brain	2hrs	160. Identify the different parts of the brain on model.
Theme 3: Facial Paralysis			
Oral Biology & Tooth Morphology	Pharyngeal Arches, Pouches, and Clefts	2hrs	161. Describe derivatives of pharyngeal arches. 162. Describe derivatives of pharyngeal pouches. 163. Describe derivatives of pharyngeal clefts. 164. Describe anomalies of pharyngeal apparatus.
	Development of Face	1hrs	165. Discuss role of molecular regulation in face development.
	Development of Maxilla and Mandible	2hrs	166. Describe the development of mandible. 167. Describe the development of maxilla.
Gross Anatomy	Face	2hrs	168. Describe features of skin and superficial fascia. 169. Tabulate facial muscles, their origin, insertion, actions. 170. Classify functional groups of facial muscles. 171. Describe nerve supply of face. 172. Describe blood supply of face. 173. Describe lymphatic drainage of face. 174. Enumerate relevant clinical problems of structures of face. 175. Demonstrate how different facial muscles help in facial expressions.
Neuroanatomy	Facial Nerve	2hrs	176. Explain the origin and course (intracranial, extra-cranial) of facial nerve.

			177. Enumerate the main divisions of the facial nerve. 178. Explain the distribution of its branches along with the functions. 179. Enumerate the clinical conditions associated with facial nerve.
Oral Medicine	Bell's Palsy	1hr	180. Describe the pathophysiology of bell's palsy. 181. Enlist the etiology of bell's palsy. 182. Enumerate clinical features of bell's palsy. 183. Discuss the preventive aspects of bell's palsy.
Lab Work			
Gross Anatomy	Face	2hrs	184. Identify different facial muscles on model.
Theme 4: Sore Mouth			
Oral Biology & Tooth Morphology	Tongue	1hr	185. Explain development of tongue. 186. Explain development of taste buds.
	Palate	1hr	187. Explain development of primary and secondary palate. 188. Discuss common anomalies related to the development of palate.
	Oral Cavity	2hrs	189. Describe structures of oral cavity. 190. Describe blood supply of teeth and gums. 191. Describe lymphatic drainage of oral cavity. 192. Describe nerve supply of teeth and gums.
	Hard And Soft Palate	1hr	193. Describe structure of hard and soft palate. 194. Describe muscles of the soft palate, their origin and insertion, actions.

			195. Describe nerve supply of hard and soft palate. 196. Explain lymphatic drainage of hard and soft palate
Histology	Tongue	1hr	197. Describe histological features of tongue. 198. Describe histological features of taste buds.
Anatomy	Tongue	2hrs	199. Describe external features of tongue. 200. Describe muscles of tongue, their origin and insertion, actions. 201. Explain blood supply of tongue. 202. Describe lymphatic drainage of tongue. 203. Enumerate the nerve supply of tongue. 204. Enumerate relevant clinical problems tongue (glossitis, lingual tonsil, carcinoma etc.).
Neuroanatomy	Hypoglossal Nerve	1hr	205. Explain the origin, course, and branches of hypoglossal nerve. 206. Describe the clinical significance of hypoglossal nerve.
	Glossopharyngeal Nerve		207. Explain the origin, course, branches of the divisions of the glossopharyngeal nerve.
Lab Work			
Oral Biology & Tooth Morphology	Hard And Soft Palate	2hrs	208. Demonstrate surface marking of different structures of hard and soft palate on model.
Anatomy	Tongue	2hrs	209. Identify the histological features of tongue and taste buds.

Theme 5: Dental Caries

Oral Biology & Tooth Morphology	Enamel	6hrs	<p>210. Discuss the organic and inorganic composition of enamel.</p> <p>211. Explain enamel crystallites, rods, orientation, and their strength.</p> <p>212. Discuss histological structures of enamel, their significance.</p> <p>213. Differentiate enamel spindle, tufts, and lamellae.</p> <p>214. Define and discuss significance of dentin enamel junction.</p> <p>215. Describe life cycle of Ameloblast with theoretical background of each stage.</p> <p>216. Interpret amelogenesis including matrix formation and mineralization.</p> <p>217. Enlist enamel proteins and their role in amelogenesis.</p> <p>218. Discuss Defects of development and amelogenesis including amelogenesis imperfecta, fluorosis etc.</p> <p>219. Discuss clinical considerations including enamel pathologies encompassing hereditary disorders and environmental defects, carious and non-carious defects, enamel loss and staining of enamel.</p> <p>220. Interpret the life cycle of ameloblast with schematic diagram.</p>
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	Dentine	5hrs	<p>221. Describe physical and chemical properties of dentin.</p> <p>222. Explain microscopic structures of dentin covering dentinal tubules, peritubular dentin, intertubular dentin, pre-dentin.</p> <p>223. Describe of odontoblast with diagrammatic representation in detail.</p> <p>224. Types of dentin including primary secondary and tertiary dentin.</p> <p>225. Differentiation of incremental lines, interglobular dentin, granular layer.</p> <p>226. Interpret different types of incremental lines seen in dentin.</p> <p>227. Describe the age changes related to dentin.</p> <p>228. Review development of dentin with complete comprehension of dentinogenesis.</p> <p>229. Compare the process of amelogenesis and dentinogenesis.</p> <p>230. Enlist the genes effecting dentinogenesis.</p> <p>231. Explain hypersensitivity of dentin and its mechanism.</p> <p>232. Discuss the theories of pain transmission and hydrodynamic.</p>
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	Cementum	4hrs	<p>233. Discuss introduction to cementum with explanation of its physical and chemical properties.</p> <p>234. Enlist growth factors which control cementogenesis.</p> <p>235. Define cementogenesis with complete description of cement oblast structure and its origin.</p> <p>236. Describe types of cementum and tabulate differences of various types including cellular and a cellular cementum.</p> <p>237. Discuss cement dentinal and cement enamel junction and explain its types.</p> <p>238. Draw diagram of cement enamel junctions.</p> <p>239. Enumerate functions of cementum with short description.</p> <p>240. Correlate cementum pathologies clinically.</p> <p>241. Explain hypercementosis associated with difficult extraction.</p>
Oral Biology & Tooth Morphology	Maxillary 1 st and 2 nd Pre-molars	2hrs	<p>242. Discuss initiation of calcification, age of crown completion, age of eruption, and root completion.</p> <p>243. Discuss arch position and general outlines.</p> <p>244. Describe various aspects (labial, lingual, mesial, distal, and occlusal aspect) of crowns of maxillary pre-molars.</p> <p>245. Describe number, location and significance of pulp horns, chamber, and canals.</p> <p>246. Describe number, shape, and inclination of roots.</p> <p>247. Differentiate between maxillary 1st and 2nd premolar.</p>
Biochemistry	Role of Calcium, Phosphorus in Teeth	1hr	<p>248. Discuss the role of Calcium and Phosphorus in formation of cellular matrix and bone.</p>

			249. Explain the role of Calcium and Phosphorus in the development of bones and teeth.
	Magnesium	1hr	250. Discuss the role of Magnesium in formation of cellular matrix and bone.
Community and Preventive Dentistry	Prevention of Dental Caries	1hr	251. Discuss the epidemiology, etiology, and prevention of dental caries. 252. Discuss the role of fluoride to prevent the dental caries .
Lab Work			
Oral Biology & Tooth Morphology	Maxillary 1 st and 2 nd Pre-molars	4hrs	253. Identify crown outline, buccal, lingual, mesial, distal surfaces, occlusal table and its components on tooth models/specimens or images. 254. Draw and label different aspects of maxillary pre-molars.
Theme 6: Swollen Eye			
Gross Anatomy	Bony Orbit	1hr	255. Describe walls and openings in the orbital cavity. 256. Enumerate foramen and fissures in bony orbit and structures passing through it.
	Extraocular Muscles	1hr	257. Explain origin, insertion, nerve supply and action of extraocular muscles.

	Eye Ball	2hrs	258. Describe features & relevant clinical anatomy of: <ul style="list-style-type: none"> • Outer Coat • Cornea • Middle Coat • Inner Coat • Aqueous Humour • Vitreous Body
	Lacrimal Gland and Ciliary Gland	1hr	259. Discuss lacrimal and ciliary glands.
	Ophthalmic Artery Ophthalmic Vein	1hr	260. Explain origin, course, and relations of ophthalmic artery. 261. Describe branches of ophthalmic artery. 262. Describe parts of ophthalmic vein. 263. Describe supply of ophthalmic vein. 264. Discuss clinical significance associated with the vessels.
Neuroanatomy	Cranial Nerves II, III, IV, VI	2hrs	265. Explain the Origin, course, branches, and functions of: <ul style="list-style-type: none"> • Optic Nerve • Oculomotor Nerve • Trochlear nerve • Abducent nerve 266. Discuss clinical significance associated with the nerves
	Cavernous Sinus	1hr	267. Explain the important relations of the cavernous sinus. 268. Enumerate the contents of the cavernous sinus.
Physiology	Overview of functions of eye	2hrs	269. Describe the physiological anatomy of eye. 270. Define errors of refraction.

	Photochemistry of Vision and Eye Movements	2hrs	271. Describe the structure of rods and cons. 272. Describe the importance of blind spot. 273. Define visual acuity. 274. Explain light and dark adaptation.
Biochemistry	Vitamin A	1hr	275. Discuss the role of vitamin A.
Oral Biology & Tooth Morphology	Maxillary & Mandibular Canines	2hrs	276. Discuss initiation of calcification, crown completion age, age of eruption and root completion age. arch position, general outline. 277. Describe various aspects (labial, lingual, mesial, distal, and incisal) of crowns of maxillary and mandibular canines. 278. Discuss number, shape, and inclination of root. 279. Discuss number, location and significance of pulp horns, chamber, and canal. 280. Differentiate between maxillary and mandibular canines.
Lab Work			
Oral Biology & Tooth Morphology	Maxillary & Mandibular Canines	4hrs	281. Identify labial depressions, imbrication lines, height of contour, cingulum, lingual fossa, marginal ridges, incisal slop on tooth models/specimens or images. 282. Draw and label different aspects of maxillary and mandibular canines.

Theme 7: Nosebleed

Gross Anatomy	Nose	1hr	<p>283. Describe features of nose.</p> <p>284. Describe blood supply of nose.</p> <p>285. Describe nerve supply of nose.</p> <p>286. Describe lymphatic drainage of nose.</p> <p>287. Enumerate relevant clinical problems of nose (e.g., rhinitis, fracture of cribriform plate, epistaxis etc.).</p>
	Lateral and Medial Wall of Nose	1hr	<p>288. Discuss features of lateral wall of nose.</p> <p>289. Discuss features of conchae and meatuses.</p> <p>290. Describe blood supply of conchae and meatuses.</p> <p>291. Describe nerve supply of conchae and meatuses.</p> <p>292. Describe lymphatic drainage of conchae and meatuses.</p> <p>293. Discuss allergic rhinitis.</p>
	Paranasal Sinuses	1hr	<p>294. Discuss features of paranasal sinuses (frontal, maxillary, sphenoidal, ethmoidal).</p> <p>295. Explain relations of sinuses.</p> <p>296. Describe blood supply of sinuses.</p> <p>297. Describe nerve supply of sinuses.</p> <p>298. Describe lymphatic drainage of sinuses.</p> <p>299. Enumerate relevant clinical problems related to sinuses (e.g., carcinoma of maxillary sinus, sinusitis etc).</p>
	Pterygopalatine Ganglion	1hr	<p>300. Describe features of pterygopalatine ganglion.</p> <p>301. Explain connections of Pterygopalatine ganglion.</p>

			302. Describe branches of Pterygopalatine ganglion. 303. Enumerate relevant clinical problems related to Pterygopalatine ganglion.
Neuroanatomy	Olfactory Nerve	1hr	304. Explain the origin, course, and function of the olfactory nerve. 305. Describe the clinical aspects associated with Olfactory nerve.
Oral Biology & Tooth Morphology	Maxillary Sinus	2hrs	306. Enumerate the para nasal sinuses. 307. Describe the anatomical structures & boundaries of maxillary sinus. 308. Discuss the development and functions of maxillary sinus. 309. Describe the microscopic features such as mucus membrane and epithelium of maxillary sinus to differentiate between oral mucosa & respiratory mucosa.
Physiology	Sense of Smell	1hr	310. Describe olfactory membrane. 311. Explain mechanism of excitation of the olfactory cells. 312. Discuss Rapid Adaptation of Olfactory Sensations. 313. Describe transmission of smell signals into the central nervous system.
Lab Work			
Gross Anatomy	Lateral Wall of Nose	2hrs	314. Demonstrate anatomical features of conchae and meatuses on model.
Physiology	Sense of Smell	2hrs	315. Examine a standardized patient for olfactory nerve.

Learning Resources

S#	Subjects	Resources
1.	Anatomy	<p>A. GROSS ANATOMY</p> <ol style="list-style-type: none"> 1. BD Churasia 2. Last's Anatomy <p>B. EMBRYOLOGY</p> <ol style="list-style-type: none"> 1. Langman's Medical Embryology <p>C. HISTOLOGY</p> <ol style="list-style-type: none"> 1. Medical Histology By Laiq Hussain <p style="text-align: center;">Reference Books</p> <ol style="list-style-type: none"> 1. Netter Atlas of Human Anatomy 2. Gray's Anatomy
2	Biochemistry	<p style="text-align: center;">Text Books</p> <ol style="list-style-type: none"> 1. Lippincott illustrated reviews 8th 2. Harper's illustrated Biochemistry 30th 3. U. Satyanarayan and U. Chakarpani 4th <p style="text-align: center;">Reference Books</p> <ol style="list-style-type: none"> 1. Lippincott illustrated reviews 2. MLA. Harvey, Richard A., PhD. Lippincott's illustrated reviews: Biochemistry 3. U. Satyanarayana Biochemistry 4. U. satyanarayan and U. Chakarpani 4th edition 5. Harper's illustrated Biochemistry 6. Rodwell VW, Bender DA ,Botham KM., Kennelly PJ, Weil P. Eds. Victor W. Rodwell et al. 7. Fundamentals of Biochemistry 8. Donald V., Judith G. Voet, Charlotte W. John wiley and sons, New york 9. Netter's essential Biochemisty 10. Lippincott illustrated reviews 11. MLA. Harvey, Richard A., PhD. Lippincott's illustrated reviews: Biochemistry

3	Physiology	<p style="text-align: center;">Textbooks</p> <ol style="list-style-type: none"> 1. Guyton and Hall Textbook of Medical Physiology, 13th Edition by John E. Hall. 2. Human Physiology: From Cells to Systems, 8th Edition by Lauralee Sherwood 3. Ganong's Review of Medical Physiology, 24th Edition (LANGE Basic Science) by Kim E. Barrett, Susan M. Barman, Scott Boitano, Heddwen Brooks. <p style="text-align: center;">REFERENCE BOOKS</p> <ol style="list-style-type: none"> 1. Manual of Experimental Physiology 4 th Edition Prof. Dr. Zafar Ali Choudry 2. Practical Physiology 1st Edition Prof. Dr. Shafiq Ahmed Iqbal 3. Basis of Clinical Physiology Volume 1 Prof. Dr. Muhammad Akram 4. Basis of Clinical Physiology Volume 2 Prof. Dr. Muhammad Akram 5. System wise SEQs and MCQs with key Reference: Physiology by Guyton 1 st Edition Prof. Dr. Samina Malik
4	Oral Biology	<p style="text-align: center;">Textbook</p> <ol style="list-style-type: none"> 1. Ten Cate's Oral Histology 2. Orban's Oral Histology and Embryology 3. Concise Dental Anatomy and Morphology by James L. Fuller <p style="text-align: center;">Reference Books</p> <ol style="list-style-type: none"> 1. Oral Anatomy, Histology and Embryology by B.K.B Berkovitz