

Oral Biology and Tooth Morphology

Curriculum & Study Guide

Session 2021-22

First Year BDS

Institute of Dentistry, CMH

Lahore Medical College

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INTRODUCTION TO STUDY GUIDE

This study guide book is designed for Dental undergraduates by consolidated effort of all subjects across the year to provide Dental students of IOD CMH Lahore Medical College a resource material which would highlight important aspects of curriculum. The study guide aims to promote self-regulated lifelong learning among students by giving them the control over their learning.

The pervasive curriculum aspects of undergraduates' competencies, assessment policies and curriculum coordinators are mapped in his guide book. Horizontal integration across the year better conceptual understanding while vertical integration promotes clinically relevant understanding. IOD CMH aims to improve health indicators of society by improvement of students and doctors in preventive health service provision and health education provision to society through community programs.

The study guide gives an overview of intended course outcomes and objectives in relation to the course content. The assessment methodology tailored to intuitional strategy is provided.

This study guide has been carefully designed keeping in view PMDC and NUMS curriculum and guide lining dedicated effort by faculty is done to make this guide tailored to student's needs. Students feedback has been seeded and incorporated at all stages during study guide development. Curriculum is a living dynamic entity. Our aim to improve it by every passing day. This humble effort of all faculty acts as a guiding light for our dear students.

VISION STATEMENT

To ensure the development of internationally acclaimed quality standards and practices for NUMS Higher Education that benefits and lives up to the stakeholder's needs and expectations.

MISSION STATEMENT

To provide an excellent learning and teaching environment, inculcating ethical values and social responsibilities in undergraduate and postgraduate medical & dental students and nursing and allied health sciences students to enhance the level of comprehensive healthcare in the Army/Country

Rationale of Curriculum

The curriculum is designed to address both local and international needs. The curriculum is focused to prepare students for the international licencing exams and training abroad as well as empowering them to treat local patients with safety and efficiency. Dentists work as a healer in the community. A dentist should have evidence based and update knowledge about the epidemiology of the practicing area. The curriculum of IOD CMH LMC is planned with a collaboration of clinical and basic sciences faculty in addition to students and family medicine department to ensure that the prevailing health conditions of the society are treated and dealt with effectively. The emergence of new techniques in preservation of existing dentition and restoration of the lost dentition and oral structures has led to changes in the curriculum with more emphasis on new and advanced techniques, procedures and evolution of new and advanced technology (e.g. CAD/CAM & Implants).

Introduction to Curricular Framework

This study guide is developed as resource assistance to the students and faculty. The study guide development process included representation from teaching faculty, management, leadership of college and students. The study guide is made to achieve and alignment between societies' needs, institutional needs, patient needs & student's needs.

The curriculum implemented is a hybrid type of curriculum which has both horizontal and vertical integration. Spiral integration is introduced as an adjunct to horizontal and vertical integration. The curriculum spans over 3 phases

PHASE 1 (Year 1&2): Includes basic sciences Anatomy, Physiology, Biochemistry, Oral Biology & Tooth Morphology, Sciences of Dental Materials, Pharmacology and Community Dentistry, General Pathology, Islamiyat and Pakistan Studies. It also includes preclinical Prosthodontics and Operative Dentistry.

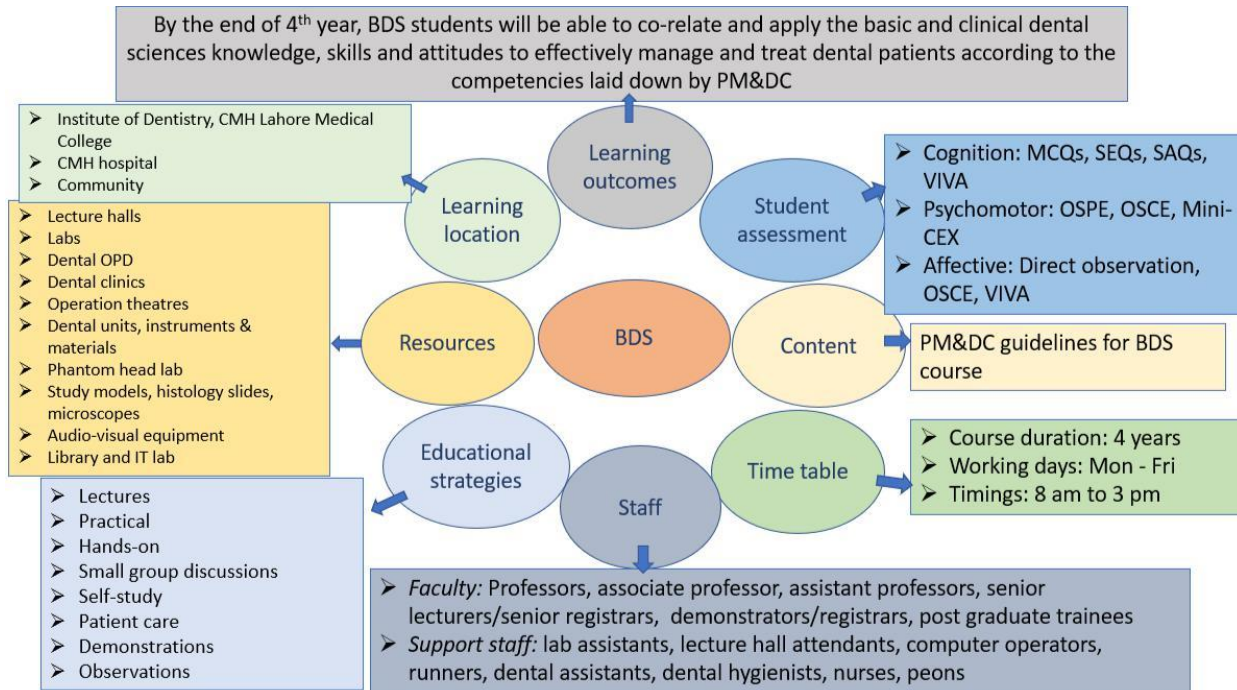
PHASE 2 (Year 3rd & Final Year): includes Periodontology, Oral Pathology, Oral Medicine, General Medicine, General Surgery, Oral Surgery, Prosthodontics, Orthodontics, Operative Dentistry.

4 Years Curricular Framework

BDS SCHEME OF STUDIES

BASIC DENTAL SCIENCES / PRE-CLINICAL YEAR		CLINICAL YEARS	
1st YEAR	2nd Year	3rd Year	Final Year
Anatomy	Science of Dental Material	Periodontology	Prosthodontics
Physiology	General Pathology	Oral pathology	Operative Dentistry
Biochemistry	Pharmacology	Oral Medicine	Oral Surgery
Pak studies & Islamic Studies	Community Dentistry	Gen. Medicine	Orthodontics
Oral Biology & Tooth Morphology	Pre-Prosthodontics	Gen. Surgery	
	Pre-Operative Dentistry	Oral Surgery	
			Prosthodontics
Self-Directed Learning Sessions			

BDS Curriculum Map



BDS Programme Curricular Outcomes

At the end of four years dental undergraduate program, the graduates should be able to:

1. Independently assess the patients, order relevant investigations, and formulate a treatment plan.
2. Render treatments in the domain of general dental practitioners to their patients in time efficient and quality-controlled manner.
3. Practice evidence-based dentistry.
4. Correlate basic dental sciences knowledge and skills with clinical dental practice.
5. Modify dental treatments according to patient's special needs, if any, in the form of medical conditions, physical or mental disabilities etc.
6. Assess and refer the patients with case difficulty indices requiring consultation or treatment by specialists.
7. Show empathy and respect in their attitude and behavior towards their patients.
8. Maintain high ethical and professional standards in their pursuit of clinical excellence.
9. Draw upon their existing knowledge and update it through continuing education programs.
10. Exercise infection control protocol guidelines laid out by their local health councils.
11. Exercise management qualities to maintain single or multiple unit private practices where applicable.
12. Work in a team of other health care professionals including dentists, dental assistants, dental hygienists, laboratory technicians, ceramists and dental nurses etc.
13. Maintain patient records with emphasis on legal and patient confidentiality aspects.
14. Provide basic life support to patients requiring critical care in or outside dental set up.
15. Manage dental emergencies in a dental set up.
16. Demonstrate clear verbal and written communication skills.

Undergraduate Competencies for Dental Graduates

IOD CMH Lahore medical College envisions to produce graduates who are proficient in following competencies at the end of 4th year

Dental Expertise

Communication

Critical-thinking

Management

Scholar

Professionalism

Evidence based practice providing holistic care

Empathetic

Providing Community service

Co-ordinators First Year BDS 2021-2022

Coordinator Name	Department	Tel Extension
Prof. Dr. Uzma Naseer Professor	Anatomy	492
Prof. Dr. Tanzeela Akram Professor	Physiology	463
Prof. Dr. Saira Atif	Oral Biology & Tooth Morphology	335
Prof. Dr. Aamenah Malik	Biochemistry	501

Class Representatives

Name	Designation
Zain Nasir	CR 1 st Year BDS
Hadia Tariq	GR 1 st Year BDS

Hours of Teaching for Year 1 BDS for the Session

Sr. No.	Subject	Lecture & Practical/Small group discussion hours
1.	Oral Biology & Tooth Morphology	200



ORAL BIOLOGY & TOOTH MORPHOLOGY STUDY GUIDE

Introduction to Oral Biology & Tooth Morphology

Oral Biology & Tooth Morphology is a basic science course taught during first year BDS. The subject deals with the development, gross and histological structure, functions and interactions of oral and craniofacial tissues. The subject of Oral Biology and Tooth Morphology includes the following main topics taught in collaboration with Anatomy and Physiology Departments.

- Oral and Developmental Histology
- Tooth Morphology and Occlusion
- Oral Physiology
- General and Orofacial Embryology

Resources

- A. Teaching resources
- B. Supporting staff
- C. Infrastructure resources

Teaching Resources

Faculty members

Department of Oral Biology & Tooth Morphology

1	Dr. Saira	Professor/HOD	BDS, M.Phil
2	Dr. Mustafa Qadeer	Associate Professor	BDS, MSc.
3	Dr. Naauman Zaheer	Associate Professor	BDS, M.Phil, PhD
4	Dr. Syeda Amna Khurram	Demonstrator	BDS
5	Dr. Musa Ejaz Farruk	Demonstrator	BDS
6	Dr. Mahnoor Khalid	Demonstrator	BDS

Supporting Staff

- Computer operator/lecture hall attendant appointed by Medical Education Dept.

Infrastructure Resources

Sr. #.	Infrastructure Resources	Quantity
1	Lecture hall <ul style="list-style-type: none">• Seating Capacity 140• Multimedia• Microphone• Computer system• White Board	1
2	Oral biology and tooth morphology lab <ul style="list-style-type: none">• Study models• Microscopes• Moulds for making plaster models of teeth• Oral histological slides• Wax knives and carvers	1
3	Mini library	1

Teaching and Learning Strategies

Multiple educational methods will be used comprising of self-study, interactive lectures, group discussions, practical, and manual dexterity skill sessions.

(i) Methods for achieving cognitive objectives

- Interactive lectures using audio visual aids on power point presentation
- Group discussions in form of large group and small group
- Collaborative learning
- Self-study and reading from learning resources

(ii) Methods for achieving psychomotor objectives

- Focusing the histological slides on microscope
- Identification of normal histological structures on slides under different magnification
- Drawing and labeling the histological slides on practical note books

(iii) Methods for achieving affective objectives

- Interaction with peers, group members, teachers, support staff etc.
- Group discussions (small and large)
- Oral presentations by students

Learning Methodologies

The following teaching /learning methods are used to promote better understanding:

- Interactive lectures
- Small group discussions
- Practical
- Skill sessions
- Self-directed learning
- Assignments
- Oral presentations by students

Interactive lectures

In large group, the lecturer introduces a topic which explains the underlying phenomena through questions, pictures, exercise, etc. Students are actively involved in the learning process.

Small group discussions

This format helps students to clarify concepts and acquire skills and attitudes. Students exchange opinions and apply knowledge gained from lectures and self-study. The facilitator role is to ask probing questions, summarize, or rephrase to help clarify concepts.

Practical

In practical sessions students observe histological slides under microscope or on multimedia for better understanding of the subject. They are also required to maintain practical manuals in which they draw and label histological diagrams and different aspects/views of teeth for better understanding.

Skill session

Students are taught to accurately carve out tooth models from soap for better understanding of tooth morphology.

Self- directed learning

Students' take responsibilities of their own learning through individual study, sharing and discussing with peers, seeking information from Learning Resource Center, teachers and resource persons within and outside the college. Students can utilize the time within the college scheduled hours or afterwards for self-study.

Assignments

Students are given written formative assignments on designated topics. Revision of the topics already covered by anatomy and physiology departments are given to students as oral presentations.

Oral presentations by students

Students are assigned topics during revision session to enhance their communication skills and group learning.

Curriculum Implementation

Curriculum implementation refers to putting into practice the official document including course content, objectives, learning and teaching strategies. Implementation process helps the learner to achieve knowledge, skills and attitudes required of the learning tasks. Learners are a pertinent component of the implementation process. Implementation occurs when the learner achieves the intended learning experiences, knowledge, ideas, skills and attitudes which are aimed to make the learner an effective part of the society. Curriculum implementation also refers to the stage at which curriculum is put into effect. There has to be an implementing agent as well. Teacher is an important part of this process and implementation of the curriculum is the way the teacher selects and utilizes various components of the curriculum. Implementation occurs when the teacher's formulated course content, teacher's personality and teaching and learning environment interact with the learners. Therefore, curriculum implementation is how the officially planned course of study is translated and reflected by the teacher into schemes of work, lesson plans, syllabus and resources are effectively transferred to the learners. Curriculum implementation can be affected by certain factors such as teachers, learners, learning environment, resource materials and facilities, culture and ideology, instructional supervision and assessments.

Personnel involved in teaching and facilitation

(i) Lectures delivery by: Dr Saira Atif (Professor & subject in-charge)

Dr Mustafa Qadeer (Associate Professor)

Dr Naauman Zaheer (Associate Professor)

(ii) Demonstrators for practical and small group discussion sessions:

Dr Syeda Amna Khurram, Dr Musa Ejaz Farruk, Dr Mahnoor Khalid

(iii) Support staff: As nominated by the medical education department.

Time Frame

Course duration: 36 weeks

Lectures: Monday & Wednesday (1:05 to 2:00 pm), Tuesday (11:15am to 12:10 pm),
Friday (10:00 to 11:00 am)

Practical/ Small group: Monday & Wednesday (2:00 to 3:00 pm)

Course Outline

Section I Oral and Developmental Histology

This subject deals with the histological study of orofacial structures including teeth. It gives a detailed information on the developmental and functional histology, of teeth and orofacial regions including periodontium, bone, salivary glands, temporomandibular joint, oral mucosa, growth, eruption and shedding of teeth. It is designed to relate the histological information to clinical significance. Part of this section is taught in collaboration with Anatomy department. It also includes association developmental anomalies.

Section II Tooth Morphology and Occlusion

This subject deals with the morphology and occlusion of permanent and deciduous teeth including morphological anomalies. It provides the basis of the skills needed in all aspects of clinical dental sciences. Without the correct knowledge of tooth morphology, it is impossible to restore or replace a tooth or part of tooth in oral cavity.

Section III Oral Physiology

This subject deals with the study of functional basis of oro-facial structures during the process of speech, mastication, deglutition, taste, saliva, pain and proprioception; and is taught in collaboration with Physiology department and revised in oral biology session.

Section IV General and Orofacial Embryology

This subject deals with the development of embryo and development of components of head and neck region such as tonsils, tongue, salivary glands, thyroid, parathyroid glands, palate, lips, face, nose, paranasal sinuses, mandible and maxilla. Taught in collaboration with Anatomy department.

Table of Specifications for Teaching and Learning Outcomes

SECTION I - ORAL AND DEVELOPMENTAL HISTOLOGY

Topic weightage: 44%

Time allocation: Approximately 16 weeks (110 hours)

Assessment items in Final Exam: Oral histology 24 MCQs, 04 SEQ/SAQ, OSPE stations 06 out of 10 and 01 long station out of 02

At the end of the session, first year BDS students should be able to:

<i>DEVELOPMENT OF TOOTH</i> <i>Lectures delivered by Dr. Saira Atif</i> <i>Practical sessions facilitated by demonstrators</i>		<i>CPA</i>	<i>Teaching/ Learning Methods</i>	<i>Assessment Methods</i>
1	Describe sequence of developmental changes occurring in maxillary and mandibular processes in areas of future dental arches during 6 th & 7 th weeks of intra uterine life	C1	Lecture	SEQ/MCQ/ VIVA
2	Define the following terms/structure: neural crest cells, ectomesenchyme, primary epithelial band, dental lamina, vestibular lamina, tooth bud, lateral lamina, successional lamina, epithelial pearls/Rest cells of Serres, Enamel organ, dental papilla, dental follicle, cervical loop, enamel knot, enamel cord, enamel niche, enamel septum, enamel navel, papillary layer, reduced enamel epithelium, pulp limiting membrane, rest cells of Malassez	C1	Lecture	SEQ/MCQ/ VIVA
3	Identify on a histological picture/slide the following structures: Oral Epithelium, Mesenchyme, Dental lamina, vestibular lamina, tooth bud also draw and label	C2 P3	Practical	OSPE
4	Distinguish, in a table, between dental and vestibular lamina on basis of development, location, histology, function, and fate	C2	Lecture	SEQ
5	Explain components/parts of dental lamina on basis of developmental timings & their attachment to primary, permanent and non-succedenous tooth buds	C1	Lecture	SEQ/MCQ/ VIVA
6	Identify components of dental lamina in histological pictures/slides (lateral lamina, successional lamina)	C2 P3	Practical	OSPE
7	Explain the clinical significance of remnants of dental lamina(epithelial pearls) i.e. eruption cysts, odontome, supernumerary tooth	C2	Lecture	SEQ/MCQ/ VIVA
8	Explain histological aspects of bud, cap and bell stages of tooth development with emphasis on cell shapes, types of cell layers and function of each cell layer (outer enamel	C1	Lecture	SEQ/VIVA

epithelium, inner enamel epithelium, stratum intermedium, stellate reticulum)

9	Identify draw and label enamel organ, dental papilla and dental follicle along with stages of tooth development in histological pictures (bud, early and late cap stage, early and late bell stage)	C2 P3	Practical	OSPE
10	Describe composition, location, histological appearance (arrangement of fibers, condensation) & fate of dental papilla and dental follicle/sac	C1	Lecture	SEQ/MCQ/ VIVA
11	Describe location, histological appearance (cell shape) & function of enamel knot, enamel cord and enamel niche	C1	Lecture	SEQ/MCQ/ VIVA
12	Identify enamel knot, cord and niche in histological pictures.	C2 P3	Practical	OSPE
13	Discuss importance and process of angiogenesis in relation with the developing tooth germ with reference to location and timings	C1	Lecture	SEQ/MCQ/ VIVA
14	Discuss relation of developing nerve fibers with early tooth germ with reference to location and timings	C1	Lecture	SEQ/MCQ/ VIVA
15	Explain inductive influences of inner enamel epithelial cells of enamel organ and peripheral cells of dental papilla on each other	C1	Lecture	SEQ/MCQ/ VIVA
16	Describe histodifferentiation, function and movement of enamel and dentin forming cells (ameloblasts and odontoblasts) in relation to each other	C1	Lecture	SEQ/MCQ/ VIVA
17	Explain source of nourishment for ameloblasts and odontoblasts during hard tissue formation	C1	Lecture	SEQ/MCQ/ VIVA
18	Describe the formation, histological structure, role and fate (disintegration and rest cells of Malassez) of Hertwig epithelial root sheath in formation of roots of single and multi-rooted teeth	C1	Lecture	SEQ/MCQ/ VIVA
19	Identify draw and label HERS, Rest cells of Malassez and root formation in histological pictures	C2 P3	Practical	OSPE
20	Describe clinical relevance of Hertwig epithelial root sheath (lateral canals/accessory canals formation, cyst development)	C2	Lecture	SEQ/MCQ/ VIVA
21	Explain relevance of root formation and root completion with tooth eruption in oral cavity with emphasis on time required for primary and permanent teeth	C1	Lecture	SEQ/MCQ/ VIVA
22	Explain the abnormalities expected to occur during tooth development in relation with tooth size and number (microdontia, macrodontia, hypodontia, anodontia, supernumery and supplemental teeth)	C2	Lecture	SEQ/MCQ/ VIVA

ENAMEL AND AMELOGENESIS		CPA	Teaching/ Learning Methods	Assessment Methods
Lectures delivered by Dr. Saira Atif				
Practical sessions facilitated by demonstrators				
1	Describe physical characteristics of enamel in terms of anatomical location, hardness, thickness, permeability, color, translucency and brittleness	C1	Lecture	SEQ
2	Define the following terms/structure: rods, inter-rod, rod sheath, amelogenesis, aprismatic enamel, papillary layer, apoptosis, primary enamel cuticle, reduced enamel epithelium, nasmyth's membrane, neonatal line, striae of retzius, cross striation, perikymata, hunter schreger bands, dentinoenamel junction, enamel tufts, enamel lamellae, enamel spindles, gnarled enamel, pits, enamel caps, focal holes, enamel brochs, attrition, abrasion, erosion	C1	Lecture	SEQ/MCQ/ VIVA
3	Describe embryological origin (from germ layer) and functions of enamel	C1	Lecture	SEQ/MCQ/ VIVA
4	Enlist chemical composition of enamel including percentage of each content	C1	Lecture	SEQ/MCQ
5	Describe and identify key-hole/fish scale pattern of enamel as seen in electron microscope (arrangement of rod, inter-rod and rod sheath) also draw and label	C2	Lecture	MCQ/SEQ/ OSPE
6	Describe dimension, shape, function and growth of enamel crystallites (hydroxyapatite)	C1	Lecture	SEQ/MCQ
7	Describe number, course, orientation, dimension, constituents and significance of enamel rods in primary and permanent teeth	C1	Lecture	SEQ/MCQ/ VIVA
8	Enumerate different morphological and functional phases/stages which an ameloblast passes through during amelogenesis	C1	Lecture	SEQ
9	Identify, draw and label ameloblast in different stages of amelogenesis	C2 P3	Practical	OSPE
10	Explain morphogenetic, histodifferentiation and secretory phases of amelogenesis in terms of function, presence/absence of basal lamina, shape, size and arrangement of cells, location and shape of nucleus, presence/absence of mitotic activity and location of junctional complexes	C1	Lecture	SEQ/MCQ/ VIVA
11	Explain formation and location of Tome's process and its role in enamel mineralization during secretory phase of amelogenesis	C1	Lecture	SEQ/VIVA

12	Describe location, formation and function of prismatic and aprismatic enamel	C1	Lecture	SEQ
13	Classify enamel proteins according to their function during amelogenesis	C1	Lecture	SEQ
14	Describe cell shape, size and volume, protein secreting activity, apoptosis, basal lamina formation seen in ameloblasts during Transition phase of amelogenesis	C1	Lecture	SEQ/VIVA
15	Explain the modulation cycle seen during maturation phase of amelogenesis in terms of significance, changes in morphology and function of ameloblasts, and permeability of junctional complexes	C1	Lecture	SEQ/MCQ/ VIVA
16	Describe process of hydroxyapatite crystal growth and organic content degradation and removal during maturation proper of amelogenesis	C1	Lecture	SEQ/MCQ/ VIVA
17	Describe morphological changes in ameloblasts, during post maturation phase of amelogenesis	C1	Lecture	SEQ
18	Discuss incremental growth lines in enamel in terms of daily/weekly growth in um, significance, direction and causes	C1	Lecture	SEQ/MCQ/ VIVA
19	Explain cause of formation, location and significance of neonatal line in primary and permanent teeth	C1	Lecture	SEQ/MCQ/ VIVA
20	Describe location, cause, course, histological appearance and number (per um occlusally and cervically) of Perikymata in enamel	C1	Lecture	MCQ/SEQ/ VIVA
21	Describe location, cause of formation, course and histological appearance of Hunter Schreger bands in enamel	C1	Lecture	MCQ/SEQ/ VIVA
22	Identify neonatal line in pictures/histological slides of ground section of enamel, Striae of Retzius, Perikymata and Hunter Schreger bands in images/pictures, draw and label	C2 P3	Practical	OSPE
23	Describe histological appearance and significance of Dentinoenamel junction in longitudinal and cross section of a tooth	C1	Lecture	MCQ
24	Describe location, cause of formation, course, distance and content of Enamel Tufts.	C1	Lecture	MCQ/SEQ/ VIVA
25	Explain location, appearance, content and clinical significance of Enamel Lamellae	C1	Lecture	MCQ/SEQ/ VIVA

26	Discuss location, appearance, cause of formation, dimension, extension of Enamel Spindles	C1	Lecture	MCQ/SEQ/ VIVA
27	Identify, draw and label Enamel Lamellae, dentinoenamel junction, Enamel Tufts Enamel Spindles in pictures/images	C2 P3	Practical	OSPE
28	Describe cause of formation, location and significance of Gnarled enamel	C1	Lecture	MCQ/SEQ/ VIVA
29	Describe size, location and histological appearance, cause of formation of pits, enamel caps, focal holes and enamel brochs	C1	Lecture	MCQ/SEQ/ VIVA
30	Discuss morphological, histological, environmental and functional changes which occur in enamel due to aging	C1	Lecture	MCQ/SEQ/ VIVA
31	Discuss flourosis, congenital syphilis, amelogenesis imperfecta and its types in terms of clinical presentation and affected stages of amelogenesis	C2	Lecture	MCQ/SEQ/ VIVA
	<i>DENTIN AND DENTINOGENESIS</i> <i>Lectures delivered by Dr. Mustafa Qadeer</i> <i>Practical sessions facilitated by demonstrators</i>	<i>CPA</i>	<i>Teaching/ Learning Methods</i>	<i>Assessment Methods</i>
1	Define dentin, predentin, mantle dentin, circumpulpal dentin, primary dentin, secondary dentin, tertiary dentin, reactive dentin, reactionary dentin, dentinogenesis, osteodentin, von Korff's fibers, Hyaline layer, dentinal tubules, dead tracts, peritubular dentin, inter tubular dentin, inter globular dentin, granular layer of tomes, sclerotic dentin, contour lines of Owen, Lines of von Ebner	C1	Lecture	MCQ/SEQ/ VIVA
2	Describe composition by weight and volume, physical properties, innervation, vascularity, permeability, functions and age changes of dentin	C1	Lecture	MCQ/SEQ/ VIVA
3	Describe formation, location, structure, thickness and function of predentin, primary, secondary and tertiary dentin. Also draw and label	C1 P2	Lecture Practical	MCQ/SEQ/ VIVA
4	Discuss process of dentinogenesis in terms of odontoblasts formation and differentiation, role of Hertwig's epithelial root sheath, organic matrix deposition and mineralization	C1	Lecture	MCQ/SEQ/ VIVA
5	Draw and label stages of dentinogenesis	C2 P3	Practical	OSPE
6	Describe Globular and Linear Mineralization in terms of matrix vesicle formation and fusion	C1	Lecture	MCQ/SEQ/ VIVA
7	Tabulate the differences between coronal and radicular dentin in terms of location, formation and orientation of dentinal tubules	C1	Lecture	MCQ/SEQ/ VIVA

8	Identify in histological slides/pictures pre dentin, primary dentin, secondary dentin, tertiary dentin, dentinal tubule, intertubular dentin, peritubular dentin, interglobular dentin, Incremental lines, granular layer of tomes, sclerotic dentin, dead tracts	C2 P3	Practical	OSPE
9	Discuss the dentinal tubules in terms of extension diameter, content and functions	C1	Lecture	MCQ/SEQ/ VIVA
10	Describe and identify location, appearance, cause and significance of interglobular dentin, sclerotic dentin, Granular layer of Tomes. Draw and label granular layer of Tomes	C2	Lecture	MCQ/SEQ/ VIVA/ OSPE
11	Describe different theories to explain the process of dentin sensitivity	C1	Lecture	MCQ/SEQ/ VIVA
DENTAL PULP		CPA	Teaching/ Learning Methods	Assessment Methods
<i>Lectures delivered by Dr. Saira Atif Practical sessions facilitated by demonstrators</i>				
1	Describe pulp in terms of location, content, developmental origin and function	C1	Lecture	MCQ/SEQ/ VIVA
2	Describe the names, location, content and function of four histological zones seen in dental pulp under microscope	C1	Lecture	MCQ/SEQ/ VIVA
3	Identify, draw and label four histological zones of dental pulp as seen in images/slides.	C2 P3	Practical	OSPE
4	Enlist constituents of dental pulp in terms of cells and extracellular substances	C1	Lecture	SEQ
5	Discuss origin, type, size, orientation, and location of collagen fibers in dental pulp	C1	Lecture	MCQ/SEQ/ VIVA
6	Identify, draw and label functional odontoblastic cell at higher magnification	C2 P3	Practical	OSPE
7	Describe location, shape, number, arrangement, function and histological features of odontoblastic cells in a functional tooth	C1	Lecture	MCQ/SEQ/ VIVA
8	Differentiate active and resting odontoblastic cell in terms of histological features and functionality	C2	Lecture	SEQ
9	Describe histological features, shape, location and functions of cells present in pulp (fibroblasts, undifferentiated mesenchymal cells, macrophages, dendritic cells, lymphocytes)	C1	Lecture	MCQ/SEQ/ VIVA

10	Describe the orientation, histology, size, type and functions of blood vessels and nerves (myelinated, unmyelinated) in dental pulp	C1	Lecture	SEQ
11	Define and identify plexus of Rashkow in terms of histological appearance, location and function	C1	Lecture	MCQ/OSPE
12	Discuss age related changes seen in dental pulp in terms of volume, content, vascularity, innervation, pathology	C1	Lecture	SEQ
13	Describe types, formation, location, arrangement, appearance and clinical significance of pulp stones	C1	Lecture	SEQ
14	Identify pulp stones in pictures/images	C2	Lecture	OSPE

PERIODONTIUM		CPA	Teaching/ Learning Methods	Assessment Methods
Lectures delivered by Dr. Saira Atif				
Practical sessions facilitated by demonstrators				
1	Define and enumerate the components of periodontium	C1	Lecture	SEQ/VIVA
2	Define cementum, periodontal ligament, gingiva, cementoamel junction, Sharpey's fibers, cementoid, cementodental junction, hypercementosis, ankylosis, cementicles, lamina dura, bundle bone	C1	Lecture	SEQ/MCQ/ VIVA
3	Describe physical properties of cementum in terms of harness, location, thickness, function, vascularity, innervation, types, formative cells and permeability	C1	Lecture	SEQ/MCQ/ VIVA
4	Identify cementum in images/slides of ground section of tooth	C2	Lecture	OSPE
5	Discuss chemical composition of cementum in %age (inorganic and organic including names of cells, types of collagen fibers and non collagenous proteins)	C1	Lecture	SEQ/MCQ/ VIVA
6	Classify cementum in terms of presence or absence of cells, origin of collagen fibers (extrinsic and intrinsic) and combination of both	C1	Lecture	SEQ/MCQ/ VIVA
7	Identify in histological pictures/slides also draw and label the different types of cementum	C2 P3	Practical	OSPE
8	Describe the four cementum types (primary, secondary, mixed and acellular) in terms of cells, origin of fibers, location, function, formation/development and mineralization	C1	Lecture	SEQ/MCQ/ VIVA
9	Differentiate intrinsic and extrinsic collagen fibers in terms of formation, location, histology and dimension	C2	Lecture	SEQ/MCQ/ VIVA
10	Classify cementoamel junction in terms of enamel and cementum overlapping also discuss clinical significance	C2	Lecture	SEQ/MCQ/ VIVA

11	Describe histological appearance and significance of cementodentinal junction	C1	Lecture	SEQ/MCQ/ VIVA
12	Discuss age related changes occurring in cementum in terms of appearance, thickness, cementicles and repair process	C1	Lecture	SEQ/MCQ/ VIVA
13	Describe periodontal ligament development, location, average width, content (names of cells, types of collagen fibers, elastic and reticular fibers, ground substance) function, remodeling and age changes	C1	Lecture	SEQ/MCQ/ VIVA
14	Enumerate the five principal fiber bundles of periodontal ligament	C1	Lecture	SEQ/MCQ/ VIVA
15	Identify in images/histological slides, draw and label, and also describe the location, direction/orientation, origin, insertion and function of principal fibers of periodontal ligament	C2 P3	Lecture Practical	SEQ/MCQ/ VIVA/ OSPE
16	Describe blood supply of periodontal ligament in terms of names of blood vessels, branching pattern, routes, plexus location, diameter, difference in vascularity of anterior vs posterior teeth, mandible vs maxillary teeth.	C1	Lecture	SEQ/MCQ/ VIVA
17	Discuss nerve supply of periodontal ligament in terms of names of nerves, types of nerve fibers, location and branching	C1	Lecture	SEQ/MCQ/ VIVA
18	Discuss names, location, histological appearance and function of nerve endings present in periodontal ligament	C1	Lecture	SEQ/MCQ/ VIVA
19	Discuss histological changes seen in supporting system of tooth in increased or decreased function load	C1	Lecture	SEQ/ VIVA
20	Define Attached gingiva, free gingiva, gingival sulcus, junctional epithelium, sulcular epithelium, dentogingival junction, Col	C1	Lecture	SEQ/MCQ/ VIVA
21	Identify in images/ patients gingiva, free gingiva, attached gingiva, col, interdental gingiva	C2 P3	Practical	OSPE
22	Identify in images/histological slides, draw and label, and also describe the location, direction/orientation, origin, insertion and function of principal fibers of gingival ligament ductal system e.g. staining, shape of acini, number of secretory cells per acini, shape of secretory cells, shape location and size of nucleus, location of cell organelles, lumen size, granules, serous demilunes etc) and gross	C2	Lecture Practical	SEQ/MCQ/ VIVA/ OSPE VIVA VIVA

ORAL MUCOSA		CPA	Teaching/ Learning Methods	Assessment Methods
Anatomy Department				
1	Define oral mucosa, vermillion border, vermillion zone, vestibule, mucogingival junction, mucocutaneous junction, submucosa	C1	Lecture	MCQ/SEQ/ VIVA
2	Describe boundaries, appearance, texture, histology, functions, age changes, blood supply and nerve supply of oral mucosa	C1	Lecture	MCQ/SEQ/ VIVA
3	Classify and identify (in images/pictures/slides) oral mucosa according to location and function (masticatory mucosa, lining mucosa, specialized mucosa)	C2 P3	Lecture Practical	SEQ/VIVA/ OSPE
4	Describe histological features of lamina propria (papillary layer, reticular layers, cells, fibers, ground substance, blood vessels, nerves)	C1	Lecture	SEQ/VIVA

5	Tabulate histological differences between keratinized and non-keratinized oral epithelium in terms of name of cell layers, cell shapes, nucleus size and location	C1	Lecture	MCQ/SEQ/ VIVA
6	Identify in histological pictures/images keratinized and non-keratinized epithelium	C2 P3	Practical	OSPE
7	Discuss location, shape, covering epithelium and function of tongue papillae (fungiform, filiform, circumvallate papillae)	C1	Lecture	MCQ/SEQ/ VIVA
8	Identify tongue papillae in histological slides/images	C2 P3	Practical	OSPE
9	Discuss and identify histological features (shape, size, type of cells), location and function of taste bud	C2 P2	Lecture Practical	MCQ/SEQ/ VIVA/ OSPE
Oral Biology Department Lectures delivered by Dr. Mustafa Qadeer Practical sessions facilitated by demonstrators		CPA	Teaching/ Learning Methods	Assessment Methods
10	Define Fordyce spot, linea alba, odland body, keratohyaline granules, orthokeratinization, parakeratinization, acanthosis, acantholysis, hyperkeratosis, keratinocytes, non-keratinocyte, melanosomes, melanophage	C1	Lecture	MCQ/ VIVA
11	Identify fordyce's granules in pictures/images	C2 P3	Practical	OSPE
12	Describe location, shape, size and significance of Odland bodies/membrane coating granules/lamellar bodies in keratinized and non-keratinized epithelium	C1	Lecture	MCQ/SEQ/ VIVA
13	Describe location, shape, size of keratohyaline granules in keratinized and non-keratinized epithelium	C1	Lecture	MCQ/SEQ/ VIVA
14	Describe and identify histological features and functions of non-keratinocyte in oral epithelium (melanocytes, langerhans, merkel, inflammatory cells) in terms of shape of cell, origin and location	C2	Lecture	MCQ/SEQ/ VIVA
15	Describe exogenous and endogenous pigmentation in oral cavity with examples (Amalgam tattoo, Burton line)	C1	Lecture	MCQ/SEQ/ VIVA
16	Identify on patients/images junctions in oral cavity (mucogingival, dentogingival, mucocutaneous)	C2 P2	Practical	OSPE
17	Draw and label histology of taste bud	C2 P2	Practical	OSPE
BONE		CPA	Teaching/ Learning Methods	Assessment Methods
Anatomy Department				
1	Define bone, alveolar bone, alveolar process, lamina dura, sharpey's fibres, bundle bone, Supporting bone, cortical bone, spongy bone, interdental bone, inter radicular bone,	C1	Lecture	MCQ/SEQ/ VIVA

	periosteum, endosteum, osteon, haversian canal, volkman's canal, circumferential lamellae, concentric lamellae, interstitial lamellae			
2	Classify bone according to gross appearance and development	C1	Lecture	MCQ/SEQ/ VIVA
3	Discuss histology of compact and spongy bone in terms of formative and resorptive cells (osteoblasts, osteocytes, osteoclasts), lamellae, Haversian and volkman's canals	C1	Lecture	MCQ/SEQ/ VIVA
4	Describe histology and function of osteoblast, osteocyte and osteoclasts	C1	Lecture	MCQ/SEQ/ VIVA
5	Identify in histological slides/images compact and spongy bone and bone cells	C2 P3	Practical	OSPE
Oral Biology Department		CPA	Teaching/ Learning Methods	Assessment Methods
Lectures delivered by Dr. Naauman Zaheer				
Practical sessions facilitated by demonstrators				
6	Describe and identify histological changes and features of intramembranous and intracartilaginous ossification	C2	Lecture	MCQ/SEQ/ VIVA
7	Describe composition, function, regulation, remodeling (phases, normal turnover rate in cortical and trabecular bone, turnover rate in children /adults/old age) and age changes and repair and regeneration of bone	C1	Lecture	MCQ/SEQ/ VIVA
8	Draw and label compact bone histology	C2 P3	Practical	OSPE

TOOTH ERUPTION AND SHEDDING		CPA	Teaching/ Learning Methods	Assessment Methods
Lectures delivered by Dr. Saira Atif				
Practical sessions facilitated by demonstrators				
1	Define eruption, shedding, preruptive tooth movement, eruptive tooth movement, post eruptive tooth movement, active eruption, passive eruption, Gaubernacular cord, Gaubernacular canal, natal teeth, neo natal teeth	C1	Lecture	MCQ/ VIVA
2	Differentiate the three types of physiological tooth movements (pre-eruptive, eruptive and post eruptive) in terms of direction of movement, movement in μm , need and significance	C1	Lecture	MCQ/SEQ/ VIVA
3	Discuss mechanism and factors responsible for eruptive tooth movement	C1	Lecture	SEQ/ VIVA
4	Describe the three types of movement a tooth makes post eruption to maintain its functional position in the jaw in terms of mechanism and significance	C1	Lecture	MCQ/SEQ/ VIVA
5	Discuss histology and causes of tooth shedding	C1	Lecture	SEQ/ VIVA
6	Enlist local and systemic causes of premature and delayed eruption of teeth	C1	Lecture	SEQ/VIVA
7	Identify in images/slides also draw and label Gaubernacular cord	C2 P2	Practical	OSPE

SECTION II - TOOTH MORPHOLOGY AND OCCLUSION

Topic weightage: 23%

Time allocation: Approximately 11 weeks (60 hours)

Assessment items in Final Exam: 12 MCQs, 03 SEQ/SAQ, OSPE stations 03 out of 10 and 01 out of 02 long station

At the end of the session, first year BDS students should be able to:

<i>Introduction to Tooth Morphology/ Nomenclature</i>		CPA	Teaching/ Learning Methods	Assessment Methods
<i>Lectures delivered by Dr. Naauman Zaheer</i>				
<i>Practical sessions facilitated by demonstrators</i>				
1	Classify dentition according to shape (homodont, heterodont), sets of teeth (monophyodont, diphyodont, polyphyodont), time period (deciduous, permanent)	C1	Lecture	SEQ/VIVA
2	Discuss time frame and significance of dentition periods (primary, mixed and permanent)	C1	Lecture	MCQ/SEQ/ VIVA
3	Describe dental formulae, sequence of eruption and age of emergence of permanent and deciduous teeth.	C1	Lecture	MCQ/SEQ/ VIVA
4	Discuss commonly used numbering systems (universal, palmer notation and FDI) used in dentistry with examples from primary and permanent teeth	C1	Lecture	MCQ/SEQ/ VIVA
5	Define, identify and differentiate, on tooth specimen/models/images, anatomical crown, clinical crown, anatomical root, clinical root, enamel, dentin, cementum, cervical line, pulp cavity, cusps, tubercles, cingulum, ridges (marginal, triangular, transverse, oblique and cusp ridges), inclined plane, mamelons, fossa, developmental (primary) groove, supplemental (secondary) groove, fissure, embrasures, sulcus, pit, contact point, contact area, lobe, line angles, point angles, tooth surfaces (mesial, distal, lingual/palatal, buccal/labial, incisal/occlusal), height of contour	C2 P3	Lecture Practical	MCQ/SEQ/ VIVA/ OSPE
6	Enumerate line and point angles of anterior and posterior teeth.	C2	Lecture	SEQ/VIVA
7	Describe number and significance of lobes in permanent and primary teeth	C1	Lecture	MCQ/ VIVA
8	Describe shape, location and function of interproximal spaces, embrasures and contact areas	C2	Lecture	MCQ/SEQ/ VIVA
<i>PERMANENT INCISORS</i>		CPA	Teaching/ Learning Methods	Assessment Methods
<i>Lectures delivered by Dr. Mustafa Qadeer</i>				
<i>Practical sessions facilitated by demonstrators</i>				
1	Tabulate initiation of calcification, completion of enamel and root in terms of months/years	C1	Lectures	MCQ/ VIVA

2	Discuss and identify, on models/images/teeth specimen, the general considerations including tooth surfaces, shape of mesial, distal, labial, lingual and incisal outlines, mesiodistal dimensions and contours, inclination of incisal margin, shape of mesioincisal and distoincisal line angles, shape and curvature of cervical margin, number and location of developmental depressions, location and boundaries of lingual fossa, location, shape and inclination of cingulum, location of imbrications lines, marginal ridges, height of contour, contact area	C2 P3	Lecture Practical	MCQ/SEQ/ VIVA/ OSPE
3	Describe number, shape and inclination of root	C1	Lecture	MCQ/SEQ/ VIVA
4	Describe number, location and significance of pulp canals and pulp horns	C1	Lecture	MCQ/SEQ/ VIVA
5	Differentiate, on morphological basis, central and lateral incisor of the same and/or different arch	C2 A	Assignment / Small group discussion	SEQ/VIVA
6	Draw and label incisors from labial, lingual, mesial, distal and incisal aspect	C2 P3	Practical	Manual & OSPE
7	Carving of Maxillary central incisor according to natural tooth dimensions on wax block/soap	P2	Practical	-
<i>PERMANENT CANINES</i>		<i>CPA</i>	<i>Teaching/ Learning Methods</i>	<i>Assessment Methods</i>
<i>Lectures delivered by Dr. Mustafa Qadeer</i>				
<i>Practical sessions facilitated by demonstrators</i>				
1	Tabulate initiation of calcification, completion of enamel and root in terms of months/years	C1	Lecture	MCQ/VIVA
2	Describe and identify, on models/images/teeth specimen, the general considerations including tooth surfaces, shape of mesial, distal, labial, lingual and incisal outlines, mesiodistal dimensions and contours, length and inclination of mesioincisal and distoincisal slope, shape and curvature of cervical margin, location, and extent of lingual and buccal ridges, number and location of developmental depressions, location and boundaries of lingual fossae, location shape and inclination of cingulum, marginal ridges, height of contour, contact area	C2 P3	Lecture	MCQ/SEQ/ VIVA/ OSPE
3	Describe number, shape, inclination and variation of root	C1	Lecture	MCQ/SEQ/ VIVA
4	Describe number, location and significance of pulp canals and pulp horns	C1	Lecture	MCQ/SEQ/ VIVA
5	Differentiate, on morphological basis, mandibular and maxillary canine, canine and incisors	C2	Formative Assignment	-
6	Draw and label canines from labial, lingual, mesial, distal and occlusal aspect	C2 P3	Practical	Manual & OSPE

PREMOLARS		CPA	Teaching/ Learning Methods	Assessment Methods
<i>Lectures delivered by Dr. Naauman Zaheer</i>				
<i>Practical sessions facilitated by demonstrators</i>				
1	Tabulate initiation of calcification, completion of enamel and root in terms of months/years	C1	Lecture	MCQ/VIVA
2	Describe and identify, on models/images/teeth specimen, tooth surfaces, shape of mesial, distal, buccal, lingual/palatal and occlusal outlines, mesiodistal dimensions and contours, shape and curvature of cervical margin, boundaries of occlusal table; number, location, size, variation (U, H and Y type occlusal morphology in case of mandibular 2 nd premolar) of cusps, name, number and location of pits, grooves and fossae, boundaries of fossae, location, size, variations of marginal ridges, height of contour, contact area, mesial concavity, developmental depressions, location and formation of transverse ridge, location and names of cusp ridges and inclined planes,	C2 P3	Lecture	MCQ/SEQ/ VIVA/ OSPE
3	Describe number, shape, inclination and variations of root/roots	C1	Lecture	MCQ/SEQ/ VIVA
4	Describe number, location and significance of pulp canals and pulp horns	C1	Lecture	MCQ/SEQ/ VIVA
5	Differentiate, on morphological basis, mandibular and maxillary premolars	C2	Formative Assignment	-
6	Draw and label premolars from buccal, lingual/palatal, mesial, distal and occlusal aspect	C2 P3	Practical	Manual & OSPE
MOLARS		CPA	Teaching/ Learning Methods	Assessment Methods
<i>Lectures delivered by Dr. Naauman Zaheer</i>				
<i>Practical sessions facilitated by demonstrators</i>				
1	Tabulate initiation of calcification, completion of enamel and root in terms of months/years	C1	Lecture	MCQ/VIVA
2	Describe and identify, on models/images/teeth specimen, tooth surfaces, shape of mesial, distal, buccal, lingual/palatal and occlusal outlines, mesiodistal and buccolingual dimensions and contours, shape and curvature of cervical margin; boundaries of occlusal table, number, location, size, variation of cusps; name, number and location of pits, grooves and fossae, boundaries of fossae, location, size, location of marginal ridges, height of contour, contact area, mesial concavity, developmental depressions, location and formation of transverse ridge, location and formation of oblique ridge in case of maxillary molars, location and names of cusp ridges and inclined planes	C2 P3	Lecture Practical	MCQ/SEQ/ VIVA/ OSPE
3	Describe number, shape, inclination and variations of root/roots	C1	Lecture	MCQ/SEQ/ VIVA
4	Describe number, location and significance of pulp canals and pulp horns	C1	Lecture	MCQ/SEQ/ VIVA

5 Differentiate, on morphological basis, mandibular and maxillary molars, first and second molars of the same arch, molars and other permanent teeth	C2	Formative Assignment	-
6 Draw and label first, second and third molars from buccal, lingual/palatal, mesial, distal and occlusal aspect	C2 P3	Practical	Manual & OSPE
7 Carving of maxillary and mandibular first permanent molars according to normal tooth dimension on wax block/soap	P2	Practical	-
DECIDUOUS TEETH			
<i>Lectures delivered by Dr. Naauman Zaheer & Dr. Mustafa</i>			
<i>Practical sessions facilitated by demonstrators</i>			
1 Describe general morphological differences between permanent and deciduous teeth	C1	Lecture	MCQ/VIVA
2 Describe and identify, on models/images/teeth specimen, tooth surfaces, shape of mesial, distal, buccal, lingual/palatal and occlusal outlines, mesiodistal and buccolingual dimensions and contours, boundaries of occlusal table, number, location, size, variation of cusps; name, number and location of pits, grooves and fossae, boundaries of fossae, location, size, location of marginal ridges, height of contour, developmental depressions, location and formation of transverse and oblique ridge.	C2 P3	Lecture	MCQ/SEQ/ VIVA/ OSPE
3 Describe number, shape, inclination of root/roots	C1	Lecture	VIVA
4 Describe number, location and significance of pulp canals	C1	Lecture	MCQ/VIVA
5 Differentiate, on morphological basis, deciduous incisors vs permanent incisors, mandibular vs maxillary deciduous molars, first vs second molars of the same arch, deciduous vs permanent molars	C2	Formative Assignment	-
6 Draw and label deciduous teeth from labial/buccal, lingual/palatal, mesial, distal and incisal/occlusal aspect	C2 P3	Practical	Manual & OSPE
OCCLUSION			
<i>Lectures delivered by Dr. Saira Atif</i>			
<i>Practical sessions facilitated by demonstrators</i>			
1 Define occlusion, articulation, freeway space (normal value in mm), leeway space (normal value in mm), normal class 1 occlusion (incisal, canine and molar relation), malocclusion (I, II and III), centric occlusion, centric relation, primate space, ugly duckling stage, diastema	C1	Lecture	MCQ/SEQ/ VIVA
2 Describe features of ideal occlusion in terms of spacing, vertical inclination, overjet, overbite, and generalized spacing between the teeth in primary dentition	C1	Lecture	SEQ/VIVA
3 Describe features of ideal occlusion in mixed and permanent dentition	C1	Lecture	SEQ/VIVA
4 Define over jet (along with normal value in mm), increased, decreased, edge-to-edge and reverse overjet	C1	Lecture	MCQ/SEQ/ VIVA
5 Define over bite (along with normal value in mm), deep bite, open bite and closed bite	C1	Lecture	MCQ/SEQ/ VIVA

6 Define three types of molar relations in primary dentition (mesial step, distal step, flush terminal plane)	C1	Lecture	MCQ/SEQ/ VIVA
7 Describe occlusal curvatures (curve of Spee, Wilson and Monsoon) along with formation, direction, shape and significance	C1	Lecture	MCQ/SEQ/ VIVA
<i>DEVELOPMENTAL AND MORPHOLOGICAL ANOMALIES</i>	<i>CPA</i>	<i>Teaching/ Learning Methods</i>	<i>Assessment Methods</i>
1 Define and discuss developmental causes and morphological appearance of effected teeth in anodontia, hypodontia, mesiodens, distodens, macrodontia, microdontia, taurodontium, dilacerations, flexion, germination, fusion, concrecence, segmented roots, dwarfed roots, hypercementosis, accessory cusps, accessory roots, enamel pearls, peg laterals, Talon's cusp, Hutchinson's incisors, Mulberry molars, dens in dente, complex odontoma, compound odontoma, enamel dysplasia, dentin dysplasia, enamel hypoplasia, enamel hypocalcification, enamel hypomaturation, amelogenesis imperfect, mottled enamel, dentinogenesis imperfect, tetracycline staining, Turner's tooth	C1	Assignment	MCQ/SEQ/ VIVA
2 Enlist common anomalies effecting development, size, number and shape of teeth	C1	Assignment	SEQ/VIVA

SECTION III - ORAL PHYSIOLOGY

Topic weightage: 11%

Time allocation: Approximately 3 weeks (27 hours)

Assessment items in Final Exam: 02 MCQs, 00 SEQ/SAQ

At the end of the session, first year BDS students should be able to:

<i>ORAL PHYSIOLOGY</i>		<i>CPA</i>	<i>Teaching/ Learning</i>	<i>Assessment Methods</i>
<i>Lectures delivered by Dr. Naauman Zaheer</i>				
<i>Practical sessions facilitated by demonstrators</i>			<i>Methods</i>	
1	Describe basic events of speech production (initiation, phonation, articulation) and its neurological control by higher centers	C1	Lecture	MCQ/SEQ/ VIVA
2	Describe mastication in terms of structural apparatus, muscles involved, chewing cycle (opening, closing and occlusal phase) and neurological pathway controlling mastication	C1	Lecture	MCQ/SEQ/ VIVA
3	Enumerate stages of mastication (pull back process of tongue, squeeze back mechanism), and reflexes of mastication (jaw jerk reflex, jaw unloading reflex, jaw open reflex)	C1	Lecture	MCQ/SEQ/ VIVA
4	Discuss stages of swallowing (oral, pharyngeal and esophageal phases), names of higher centers along with neurological pathway controlling it	C1	Lecture	MCQ/SEQ/ VIVA
5	Describe physiology of pain	C1	Lecture	MCQ/SEQ/ VIVA
6	Describe physiology of proprioception	C1	Lecture	MCQ/SEQ/ VIVA
7	Describe composition, pH, volume, function (in terms of effects and components responsible for those effects), formation and secretion of saliva	C2	Lecture	MCQ/SEQ/ VIVA
8	Describe taste pathway along with its neurological control from higher centers	C1	Lecture	MCQ/SEQ/ VIVA

SECTION IV - GENERAL AND OROFACIAL EMBRYOLOGY

Topic weightage: 11%

Time allocation: Approximately 3 weeks (27 hours)

Assessment items in Final Exam: 02 MCQs, 01 SEQ/SAQ, OSPE stations 01 out of 10

At the end of the session, first year BDS students should be able to:

<i>General and Orofacial Embryology</i>		<i>CPA</i>	<i>Teaching/ Learning Methods</i>	<i>Assessment Methods</i>
<i>Anatomy Department</i>				
1	Define fertilization, zygote, embryo, germ layer, notochord, morula, blastocyst, trophoblast, neural crest cells	C1	Lecture	MCQ/SEQ/ VIVA
2	Describe germ layer formation and fate	C1	Lecture	MCQ/SEQ/ VIVA
3	Describe neural crest cells in terms of formation, migration, role in orofacial development and associated anomalies (Treacher Collins syndrome)	C1	Lecture	MCQ/SEQ/ VIVA
4	Enumerate derivatives of ectoderm, endoderm, mesoderm, neural crest cells, pharyngeal arches, pouches and clefts	C1	Lecture	MCQ/SEQ/ VIVA
5	Describe and identify development of face in terms of processes involved and their role in formation of lips, nose, forehead, cheeks and jaws	C2	Lecture	MCQ/SEQ/ VIVA/ OSPE
6	Discuss and identify in pictures/images developmental anomalies associated with incomplete fusion of facial processes (unilateral, bilateral and median cleft lip, oblique facial cleft, median cleft/frontonasal dysplasia, lateral facial cleft, mandibular cleft)	C2	Lecture	MCQ/SEQ/ VIVA/ OSPE
7	Describe and identify development of primary and secondary palate in terms of time frame, processes involved, fusion of shelves and associated anomalies (cleft palate and its types)	C2	Lecture	MCQ/SEQ/ VIVA/ OSPE
8	Discuss etiological factors responsible for congenital defects effecting facial development	C1	Lecture	MCQ/SEQ/ VIVA
9	Describe the development of tongue	C1	Lecture	MCQ/SEQ/ VIVA
10	Describe development of thyroid gland	C1	Lecture	MCQ/SEQ/ VIVA
<i>Oral Biology Department</i>			<i>Teaching/ Learning Methods</i>	<i>Assessment Methods</i>
<i>Lectures delivered by Dr. Saira Atif</i>				
<i>Practical sessions facilitated by demonstrators</i>				
11	Describe the developmental of mandible in terms of growth cartilages (names, period of activity, role and fate of primary	C2	Lecture	MCQ/SEQ/ VIVA

	and secondary growth cartilages), ossification centers, spread of ossification, post natal growth			
12	Describe the formation of different components of mandible condyle, ramus, coronoid process and body of mandible	C2	Lecture	MCQ/SEQ/ VIVA
13	Describe the prenatal growth of maxilla in terms of time frame, processes involved, location of ossification center, spread of ossification, name, location, role and fate of growth cartilages	C1	Lecture	MCQ/SEQ/ VIVA
14	Describe postnatal growth of maxilla in terms of theories associated with growth (functional matrix, cartilage growth, sutural growth), bone remodeling and its impact on growth and position of maxilla	C1	Lecture	MCQ/SEQ/ VIVA
15	Draw and label and identify in images/models both developing and mature mandible bone	C2 P3	Practical	OSPE

<p><i>Cognition Domain (Knowledge)</i></p> <p><i>C1 Recognition and Recall</i></p> <p><i>C2 Interpretation and application</i></p> <p><i>C3 Problem-solving (analysis, synthesis and judgment)</i></p>	<p><i>Psychomotor Domain (Skills)</i></p> <p><i>P1 Observe</i></p> <p><i>P2 Perform under supervision</i></p> <p><i>P3 Perform independently</i></p>	<p><i>Affective Domain (Attitudes, values and behaviors)</i></p>
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Learning Resources

Subject component	Learning resources
Oral and Developmental Histology	
1. Development of tooth	Ten Cate, A.R. and Nanci, A., 2013. <i>Ten Cate's oral histology: development, structure, and function</i> . Elsevier. 8 th edition. Berkovitz, B.K.B., Holland, G.R., Moxham, B.J., Holland, G.R. and Moxham, B.J., 2009. <i>Oral anatomy, Histology and Embryology</i> . Mosby. <i>4th International edition, 4</i> .
2. Enamel and amelogenesis	
3. Dentin and dentinogenesis	
4. Dental pulp	
5. Periodontium	
6. Salivary glands	
7. Oral mucosa	
8. Bone	
9. Temporomandibular joint	
10. Tooth eruption and shedding	
Tooth Morphology and Occlusion	
1. Introduction to Tooth Morphology/ Nomenclature	Fuller, J.L., Denehy, G.E. and Hall, S.A., 1999. <i>Concise dental anatomy and morphology</i> . University of Iowa, Publications Department. Nelson, S.J., 2014. <i>Wheeler's Dental Anatomy, Physiology and Occlusion-E-Book</i> . Elsevier Health Sciences.
2. Permanent dentition	
3. Deciduous dentition	
4. Occlusion	
5. Dental anomalies	
Oral Physiology	
1. Speech	Nelson, S.J., 2014. <i>Wheeler's Dental Anatomy, Physiology and Occlusion-E-Book</i> . Elsevier Health Sciences. Berkovitz, B.K.B., Holland, G.R., Moxham, B.J., Holland, G.R. and Moxham, B.J., 2009. <i>Oral anatomy, Histology and Embryology</i> . Mosby. <i>4th International edition, 4</i> .
2. Pain	
3. Taste	
4. Swallowing	
6. Proprioception	
7. Mastication	
General and Orofacial Embryology	
1. General embryology	Sadler, T.W., 2011. <i>Langman's medical embryology</i> . Lippincott Williams & Wilkins. 12 th edition.
2. Orofacial embryology	
Oral Anatomy	
1. Muscles of facial expression	Snell, R.S., 2011. <i>Clinical anatomy by regions</i> . Lippincott Williams & Wilkins. 9 th edition.
2. Muscles of mastication	
3. Cranial nerves	
4. Bones of head and neck	
5. Muscles of tongue	
6. Blood supply of head and neck	

Other Learning Resources

Hands-on activities	Students will be involved in practical session and hands-on activities to enhance learning.
Labs	Utilize the lab to relate knowledge to specimens and models available.
Videos	Animated videos of developmental histology to clear the concepts of the students shown during interactive lecture sessions.
Computer lab/CDs/DVDs/Internet resources	To increase the knowledge, students should utilize the available internet resources and CDs/DVDs in main IT lab/personal laptops.
Self-study	Self-study is incorporated to help the student in managing individual tasks/assignments. Student will search for information through available resources.

Study Models and Lab Supplies

	Oral Biology Lab Equipment and Supplies
1	Microscopes (shared with oral pathology lab)
2	Model trimmers (shared with prosthetics lab)
3	Bench grinders (shared with prosthetics lab)
4	Set of single tooth silicon moulds for making plaster models (4 sets)
5	Complete permanent dentition moulds for making plaster models (3 sets)
6	Oral Histology slides set
7	Development study models (PE.PD 1001 Japan)
8	Development study models (PE.PD 1002 Japan)
9	Development study models (PE.PD 1003 Japan)
10	Deciduous teeth study models-20 (B4-309 B Japan)
11	Permanent teeth study models-28 (B2-306 Japan)
12	Mixed dentition study models
13	Developing dentition model
14	Classic skull with open lower jaw
15	Tongue model
16	Classic skull painted model
17	Skull with teeth for extraction
18	Classic tooth model series
19	Half lower jaw
20	Advanced half lower jaw
21	Deciduous dentures
22	Adult dentures
23	Dentition development model
24	Plaster spatula
25	Base former silicon
26	Tooth carving step model kit 1.5x size C11.TUI Japan

Summative Assessment Methods and Policies

Internal Assessment

- Weightage of internal assessment shall be 20 %, each for theory and practical, in BDS Professional Examination.
- The Internal Assessment shall comprise of monthly test / assignments / class presentation / send-ups /class tests / OSPE etc.
- The Internal Assessment record shall be kept in the respective department of the College / Institute and after approval of Principal, a summary as per University registration number shall be furnished to the Controller of Examinations, at least two weeks before the commencement of final examination.
- The result of all the class tests / tools which contribute towards IA will be displayed to the students during an academic year.
- The same internal assessment shall be counted both for annual and supplementary examinations.
- The students who are relegated, however, can improve the internal assessment during subsequent year
- Internal assessment tools of any subject may be changed after the approval of respective FBS

Annual Examination

- The weightage of Annual Examination shall be 80%, each for theory and practical, in BDS.
- The examination comprises of a theory paper and practical/clinical examinations as per PM&DC regulations and the Table of Specifications (TOS) of the University.
- The gap between two consecutive theory papers shall not be more than two days.
- The Theory Paper shall be of 3-hours duration, held under the arrangements of the university. It shall have two parts; MCQs and SEQs for the year 2020. It may be changed after the approval of Academic Council.

Internal Examiner

He/she shall be Professor and Head of Department who has been involved in teaching of the class being examined for at least six months. Second preference shall be Associate/Assistant Professor who is involved in teaching of the class and posted there for one year. Third preference shall be a recognized Professor of the subject.

External Examiner

He/she shall be a Professor/Associate Professor of a recognized Medical/Dental College or at least an Assistant Professor with three years teaching experience in the relevant subject.

Conflict of Interest

No person shall serve as an examiner whose close relative (wife, husband, son, daughter, adopted son, adopted daughter, grand-son, grand-daughter, brother, sister, niece /nephew, son and daughter- in-law brother and sister- in-law, parental and maternal uncle and aunt etc) is appearing in the examination. All examiners likely to serve as an examiner shall render a certificate in compliance to this para.

Paper Setting

- Each College / Institute shall forward a set of two question papers as per TOS along with the key for each subject to the Controller of Examinations, at least three months in advance of the annual examination. The question paper as a whole / a question without a comprehensive key shall not be considered towards final paper setting.
- The set of question papers shall be prepared by the respective Head of Department (HoD) and furnished to Controller of Examinations through Head of Institution (HoI)
- The Controller of Examinations shall approve the faculty for the final paper setting having fair representation of each college / institute

Paper Assessment

- The Controller of Examinations shall approve the faculty for the theory paper marking, to be undertaken in the manner as deemed appropriate.
- The Examination Directorate shall coordinate directly with the faculty, earmarked for the paper marking
- A student who scores 85% and above marks in any subject shall qualify for distinction in that particular subject.
- A fraction in aggregate marks of a subject shall be rounded off to whole number. If it is less than 0.5 then it will be rounded off to the previous whole number while 0.5 or more will be rounded off to the next whole number.

Practical Examinations

- The Controller of Examinations shall approve the faculty to serve as the internal & external examiners.
- The number of external and internal examiners shall be equal.
- One external & internal examiner each shall be marked for a group of 100 students.
- Candidates may be divided into groups practical examinations and be standardized by incorporating OSPE stations.
- Practical examination shall be held after the theory examination of the subject but in special cases, it may be held before the theory examination with the approval of the Controller of Examinations. For the purpose of practical/clinical examination, the candidates may be divided into sub groups by the examiners.

- The assessment of the practical examination duly signed by internal & external examiner shall be furnished to the Controller of Examinations within one week of the conclusion of examination.

Pass Marks

- Pass marks for all subjects shall be 50 % in theory and practical, separately.
- No grace marks shall be allowed to any student in any examination.

Declaration of Result

Every effort shall be made to declare the result of each examination within one month of the last practical examination or earlier.

Promotion

No student shall be promoted to the higher classes unless he/she passes all the subjects of the previous class

Re-totaling

Any student may apply to the Controller of Examinations on a prescribed form along with the specified fee.

Supplementary Examination

The interval between a supplementary examination and the previous professional examination shall not be more than two months. There shall be no special supplementary examination.

Academic Audit

The Vice Chancellor may get any academic matter deliberated in the manner as deemed appropriate.

Issue of Academic Transcript/Detailed Marks Sheet

A student desirous of obtaining Academic Transcript / Detailed Mark Sheet may apply to Controller of Examinations along with the prescribed fee for each original copy.

Withdrawal/Failure

Any student who fails to clear the first Professional in BDS or first in four chances, availed or un-availed, shall be expelled as per PM& DC policy and shall not be eligible for fresh admission as a fresh candidate in either BDS.

Table of Specification (TOS) for Annual Examination

First Professional BDS Examination

ORAL BIOLOGY & TOOTH MORPHOLOGY

Theory

Marks of theory paper= 80
 Marks of Internal Assessment= 20
 Total Marks= 100
 Pass Marks = 50

Time Allowed = 03 hrs
 (Including MCQs)

Date:

40 x MCQs (on separate sheet) (40 Marks) (Time = 50min)
 06 x SAQs/ SEQs (Recall) = 05 marks each
 02 x SAQs/ SEQs (Application) = 05 marks each (40 Marks) (Time = 2hrs and 10 min)

S. No	Topic	Number of MCQs (40) (Recall: 35) (Application: 5) 1 mark each	Number of SAQs/SEQs (08) (05 marks each)
1.	Oral Embryology	02	01
2.	Oral Histology	24	04
3.	Oral Physiology	02	00
4.	Tooth Morphology & occlusion	12	03
	Total	40 (40 Marks)	08 (40 Marks)

Internal Assessment Calculation (Theory Annual) -20 Marks

Exams	Weightings	Exams	Percentage
End of Block & Pre- annual Exams	80%	End of Block Exam - I	20
		End of Block Exam - II	20
		End of Block Exam- III	20
		Pre-Annual Exam	20
Modular/ Class Performance	20%	Modular/ Class Tests	20
Total	100%		100%

Table of Specifications for Annual Professional Exam: Practical

VIVA VOCE 40 Marks		Practical/OSCE 40 Marks					Total
Internal Examiner	External Examiner	OSCE (10 Station) (03 marks each)			Long Station (2 Station) (05 marks each)		
		Un-Observed			Observed		
		Oral Embryology (01)	Oral Histology (06)	Tooth Morphology (03)	Oral Histology (01)	Tooth Morphology (01)	
20 Marks	20 Marks	30 Marks			10 Marks		80 Marks

Internal Assessment Calculation (Practical) – 20 Marks

Exams	Weightings	Exams	Percentage
End of Block & Pre-annual Exams	80%	End of Block Practical/OSPE I	20
		End of Block Practical/OSPE II	20
		End of Block Practical/OSPE III	20
		Pre-Annual Exam	20
Class Performance	20%	*SGD/ CBL/ PBL/ Practical	20
Total	100%		100%

* SGD= Small Group Discussion
 CBL= Case Based Learning
 PBL= Problem Based Learning

Sample Theory Paper Questions

MCQ

1. A 12 years old patient present to the dental clinic with esthetics concerns regarding his Maxillary Central Incisors. On examination enamel is found to be of normal thickness but chips off easily by applying pressure with a blunt instrument. This defect of enamel most probably occurs during which stage of amelogenesis
- Histodifferentiation phase
 - Maturation phase
 - Secretory phase
 - Transition phase
- Key: Maturation phase option b

SEQ

Q. While visiting the clinics the students noticed pigmentation on the gingiva. What type of epithelium is present in gingiva and how do you differentiate epithelium of gingiva with that of buccal mucosa on histological basis? Write down in tabulated form.

ANSWER: Gingiva has keratinized epithelium. Buccal mucosa has non-keratinized epithelium.

Keratinized Epithelium		Non-keratinized Epithelium	
Features	Cell Layer	Features	Cell Layers
Cuboidal or columnar cells containing bundles of tonofibrils and other cell organelles, site of most cell divisions	Basal	Cuboidal or columnar cells containing sparse tonofilaments and other cell organelles, site of most cell divisions	Basal
Larger ovoid containing conspicuous tonofibrils bundle, membrane –coating granules appear in upper part of layer	Prickle/spinosum	Larger ovoid cells containing dispersed tonofilaments, membrane-coating granules appear in upper part of layer: filaments becoming numerous	Prickle/spinosum

<p>Flattened cells containing conspicuous keratohyaline granules associated with tonofibrils: membrane coating granules fuse with cells membrane in upper part: internal membrane thickening also occurs.</p>	<p>Granular</p>	<p>Slightly flattened cells containing many dispersed tonofilaments and glycogen.</p>	<p>Intermediate</p>
<p>Extremely flattened and dehydrated cells in which all organelles have been lost, cells filled only with packed fibrillar material. When pyknotic nuclei are retained, parakeratinization occurs.</p>	<p>Keratinized</p>	<p>Slightly flattened cells with dispersed filaments and glycogen, fewer organelles are present, but nuclei persist.</p>	<p>Superficial</p>

Curriculum Map Oral Biology & Tooth Morphology

