



Institute of Dentistry,
CMH Lahore Medical College
Study Guide/Curriculum
Department of Science of Dental Materials
Second Year BDS
deaniod@cmhlahore.edu.pk

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 comprehension healthcare in the Army/Country

Vision Statement

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

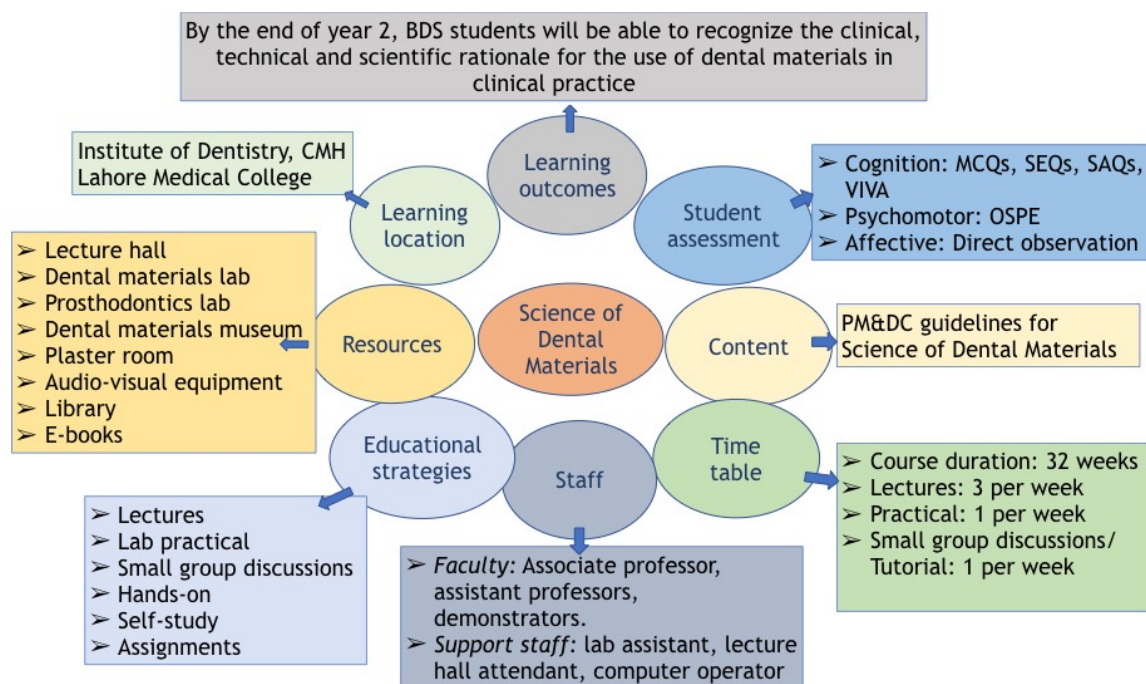
TABLE OF CONTENTS

1	INTRODUCTION TO SCIENCE OF DENTAL MATERIALS	5
2	CURRICULUM MAP	5
3	RESOURCES	6
4	TEACHING AND LEARNING STRATEGIES	8
5	LEARNING METHODOLOGIES	9
6	CURRICULUM IMPLEMENTATION	10
7	COURSE OUTLINE	12
8	TABLE OF SPECIFICATIONS FOR TEACHING AND LEARNING OBJECTIVES	14
9	LEARNING OUTCOMES	22
10	LEARNING RESOURCES	36
11	OTHER LEARNING RESOURCES	38
12	SUMMATIVE ASSESSMENT METHODS AND POLICIES	39
13	TABLE OF SPECIFICATION (TOS) FOR ANNUAL EXAMINATION	43
14	SAMPLE THEORY PAPER QUESTIONS	45

INTRODUCTION TO SCIENCE OF DENTAL MATERIALS

The subject of science of dental materials at undergraduate level enables the students to recognise the clinical, technical and scientific rationale for the use of materials in clinical dental practice. The course curriculum is designed to introduce dental materials science to students and facilitate their study of physical and chemical properties that are related to selection of these products by the dentist and to identify characteristics of materials that affect their biological safety. The practical component of the course involves hands-on experience of the materials and their manipulation in the laboratory. The subject of science of dental materials covers the following main sections:

Curricular Map Science of Dental Materials



RESOURCES

- A. Teaching resources
- B. Infrastructure resources

A. Teaching resources

i. Faculty members

Sr. #.	Faculty Name	Department as per PM & DC certificate	Qualification
1	Dr. Salman Aziz	Associate Professor	BDS, MSc, Phd
2	Dr. Usman Ashraf	Assistant Professor	BDS, MSc, Phd
3	Dr. Hammad Hassan	Sr. Demonstrator	BDS
4	Dr. Ayesha Ashraf	Demonstrator	BDS
5	Dr. Rabia Shafique	Demonstrator	BDS

ii. Supporting staff:

- Lab assistant
- Computer operator/lecture hall attendants

B. Infrastructure resources

Sr. #.	Infrastructure Resources	Quantity
1	Lecture hall <ul style="list-style-type: none"> • Seating Capacity • Multimedia • Microphone • Computer system 	1
2	Science of Dental Materials <ul style="list-style-type: none"> • Dental materials lab • Prosthodontics lab • Plaster room • Dental materials museum 	1

3	Mini library/ e-library	1
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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

- Practicing correct handling, dispensing and manipulation of different dental materials during hands on laboratory practicals

(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
- 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

It involves hands on experience with the materials so that students can understand issues related to dispensing, handling, manipulation and practical application of dental materials. 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.

Self- directed learning

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

Assignments

Students are given written formative assignments on designated topics. For revision purpose, the topics already covered 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 utilises 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

- **Lectures delivery by:** Dr. Salman Aziz (Associate Professor/Subject Incharge)
Dr. Usman Ashraf (Assistant Professor)
- **Demonstrators for practical and small group discussion sessions:**
Dr. Hammad Hassan, Dr. Ayesha Ashraf, Dr. Rabia Shafique
- **Support staff:** 2 as nominated by the medical education department
- **Computer assistant:** 1 as nominated by the college

Time frame

Course duration: 39 weeks

Lectures:

Tuesday (8:00 am to 8:50 am)

Thursday (12:40 pm to 1:30 pm)

Friday (8:50 am to 9:40 am)

Tutorial: Alternate Thursdays (1:30 pm to 3:00 pm)

Practical: Friday (10:55 am to 1:00 pm)

Self Directed Learning: Wednesday (3:00 - 4:00 pm)

Study hours lectures = 97 hours

Study hours practicals = 81 hours

Study hours tutorials = 29 hours

Total study hours = 207 hours

COURSE OUTLINE

SECTION I General classes and properties of dental materials

This section introduces students to the general classification and brief overview of different types of preventive and restorative materials used in dentistry. It illustrates the terms and principles involved in describing the clinical behaviour of these materials based on their physical, chemical and mechanical properties. It also highlights the knowledge of appreciation of certain biological considerations for use of dental materials in oral cavity and hazards associated with them. The section aims to provide basic background knowledge regarding structure of matter and to provide a comprehensive account of relationship between general properties of dental materials and their clinical performance. Another aspect of importance is the potential of this information to predict clinical performance under biological limitations and to allow the students to develop a critical understanding of the factors that determine the safe and correct use of materials in dentistry.

SECTION II Direct restorative materials

This section familiarises students with a number of key themes and subjects regarding different types of direct restorative materials used in dentistry. It is designed to provide detailed information regarding historical background, types, properties, biological consideration, clinical applications, limitations and selection criteria of direct restorative materials. The aim of this section is to allow students to develop scientific knowledge, understanding and competence in the area of direct restorative materials. Based on the information regarding their clinical behaviour and selection criteria students will be able to grasp the scientific rationale for use of these materials for their clinical applications.

SECTION III Indirect restorative materials

The section covers detailed information regarding the physical, chemical, and biological properties, manipulation and handling characteristics of indirect restorative materials used in dentistry. This includes detailed study of scientific and clinical properties of materials such as dental acrylic resins, dental ceramics and metals used in restorative dentistry. The aim of this section is to allow students to develop scientific knowledge, understanding and competence in the area of direct restorative materials. Based on the information regarding their clinical behavior and selection criteria students will be able to grasp the scientific rationale for use of these materials for their clinical applications.

SECTION IV Auxillary dental materials

The section provides information regarding variety of auxiliary dental materials used in dentistry. Auxiliary dental materials include a range of materials that are involved in the fabrication of different dental prosthesis but that do not become part of the prosthesis. The section aims to develop

knowledge regarding basic features of auxiliary dental materials used in clinical and laboratory procedures. It involves the study of composition, properties, manipulation of auxiliary dental materials and the manner in which they interact with the environment in which they are applied.

SECTION V Preventive dental materials

The section deals with the introduction and knowledge of various preventive materials used in dentistry. It describes different types of preventive dental materials associated with mechanical tooth cleaning, plaque control, fluorides, and fissure sealants. The section aims to introduce students to basic preventive dental materials used in clinical dentistry. It involves the study of composition, properties, manipulation of preventive dental materials and the criteria for proper selection for their clinical application.

SECTION VI Endodontic materials

The section focuses on the material used in endodontics that are used to irrigate and disinfect, obturate and seal the root canal system during endodontic treatment. The section introduces students to different types of endodontic materials classified according to their intended clinical uses. It involves the study of composition, properties and mode of application of various disinfectants, lubricants, sealants and obturating materials used in endodontics.

SECTION VI Laboratory practicals

The practical component covers the manipulative and applied aspects of dental material science. The laboratory practical component serves to familiarise students with the range of materials used in dentistry. It involves hands on experience with the materials so that students can understand issues related to dispensing, handling, manipulation and practical application of dental materials.

Table of Specification for teaching, learning objectives and assessment

At the end of the year the students will be able to:

	Topic and Objectives	CPA	Learning Methods	Evaluation Methods
1	<p>General Classification and Properties of Dental Materials</p> <p>Assessment items: 6 MCQ and 1 SAQ</p> <p style="text-align: right;">By Dr. Salman Aziz & Dr. Usman Ashraf</p>			
2	Understand the basic classification of dental materials i.e metals, ceramics, polymers and metals	C1	Lecture	SEQ/MCQ/VIVA
3	Describe the structure of matter and explain the principles of adhesion among dental materials	C2	Lecture	SEQ/MCQ/VIVA
4	Demonstrate knowledge of the fundamental biological, chemical and physical principles that make the foundation of the clinical behavior and application of dental materials.	C1	Lecture	SEQ/MCQ/VIVA
5	Understand the principles involving surface interaction of dental materials in biological environment.	C1	Lecture	SEQ/MCQ/VIVA
6	Demonstrate knowledge of the range of biological consideration regarding the selection and performance of dental materials for clinical applications.	C2	Lecture	SEQ/MCQ/VIVA
7	Understand the knowledge of safety, biocompatibility and biomechanics as they relate to the correct clinical use of dental materials.	C1	Lecture	SEQ/MCQ/VIVA
8	<p>Waxes, Gypsum Products & Investment Materials</p> <p>Assessment items: 4 MCQ</p> <p>Metals in Dentistry</p> <p>Assessment items: 6 MCQ</p> <p>COMBINED 1 SAQ</p> <p style="text-align: right;">By Dr. Salman Aziz, Dr. Usman Ashraf & Dr. Hammad Hassan</p>			
9	Gypsum Products			
10	Understand the properties, types, uses, and manipulation of gypsum products.	C1	Lecture	SEQ/MCQ/VIVA

	Topic and Objectives	CPA	Learning Methods	Evaluation Methods
11	Understand the method of manufacturing and properties of gypsum products used in dentistry.	C2	Lecture	SEQ/MCQ/VIVA
12	Understand the setting reactions of different types of dental gypsum products.	C2	Lecture	SEQ/MCQ/VIVA
13	Understand the manipulation factors that affect the setting time and physical and mechanical properties of gypsum products.	C2 P	Lecture / Practical	VIVA/OSPE
14	Understand and demonstrate the methods used for the disinfection of dental gypsum models and study casts.	C1	Lecture / Practical	VIVA/OSPE
15	Understand and demonstrate the proper mixing technique of dental gypsum used for preparing study models and casts.	C1 P	Lecture / Practical	VIVA/OSPE
16	Waxes			
17	Understand the classification and types of waxes used in dentistry.	C1	Lecture	SEQ/MCQ/VIVA
18	Discuss the composition, properties and application of different types of dental waxes.	C2	Lecture	SEQ/MCQ/VIVA
19	Understand and demonstrate manipulation of different types of dental waxes.	C1 P1	Lecture / Practical	SEQ/MCQ/ VIVA/OSPE
20	Investment Materials			
21	Define and explain investment materials used in dentistry.	C1	Lecture	SEQ/MCQ/VIVA
22	Understand different types of investment materials used in dentistry.	C1	Lecture	SEQ/MCQ/VIVA
23	Understand the composition, setting reaction and properties of gypsum bonded investment.	C2	Lecture	SEQ/MCQ/VIVA
24	Understand the composition, setting reaction and properties of phosphate bonded investment.	C1	Lecture	SEQ/MCQ/VIVA
25	Understand the composition, setting reaction and properties of silica bonded investment.	C1	Lecture	SEQ/MCQ/VIVA
26	Understand and compare properties and clinical applications of different types of investments.	C1	Lecture	SEQ/MCQ/VIVA
27	Metals in Dentistry Soldering & Welding			
28	Understand the basic concepts related to processing and solidification of dental alloys.	C1	Lecture	SEQ/MCQ/VIVA

	Topic and Objectives	CPA	Learning Methods	Evaluation Methods
29	Understand different types of metals and alloys used in fabrication of dental prosthesis.	C2	Lecture	SEQ/MCQ/VIVA
30	Understand the alloy phase diagrams.	C1	Lecture	SEQ/MCQ/VIVA
31	Explain the types, processing and clinical applications of high noble and noble metal alloys.	C1	Lecture	SEQ/MCQ/VIVA
32	Explain the types, processing and clinical applications of base metal alloys.	C1	Lecture	SEQ/MCQ/VIVA
33	Explain the casting procedures for metal alloys.	C1	Lecture	SEQ/MCQ/VIVA
34	Explain the types, processing and clinical applications of wrought metal alloys.	C2	Lecture	SEQ/MCQ/VIVA
35	Explain the types, processing and clinical applications of stainless steel in dentistry.	C1	Lecture	SEQ/MCQ/ VIVA/OSPE
36	Understand the significance and clinical applications for titanium and its alloys in dentistry.	C1	Lecture	SEQ/MCQ/ VIVA/OSPE
37	Describe the properties and composition of various orthodontic wires.	C1	Lecture	SEQ/MCQ/ VIVA/OSPE
38	Understand the objectives and uses of soldering and welding in dentistry.	C1	Lecture	SEQ/MCQ/VIVA
39	Understand the differences between soldering, brazing and welding.	C2	Lecture	SEQ/MCQ/VIVA
40	Describe the components of dental solders and welding.	C1	Lecture	SEQ/MCQ/VIVA
41	Understand different heat sources for soldering and welding.	C1	Lecture	SEQ/MCQ/VIVA
42	Understand welding and its types.	C2	Lecture	SEQ/MCQ/VIVA
43	Ceramics and Casting Procedures for PFM Prosthesis Assessment items: 4 MCQ and 1 SAQ <p style="text-align: right;">By Dr. Usman Ashraf</p>			
44	Understand the basic chemistry and composition of ceramics.	C1	Lecture	SEQ/MCQ/VIVA
45	Understand the composition and classification of different dental ceramics systems.	C1	Lecture	SEQ/MCQ/VIVA
46	Understand general procedures involved in fabrication of dental ceramics.	C1	Lecture	SEQ/MCQ/VIVA
47	Understand the concept of metal ceramic bonding.	C2	Lecture	SEQ/MCQ/VIVA

	Topic and Objectives	CPA	Learning Methods	Evaluation Methods
48	Understand metal ceramic restorations, their uses and properties.	C1	Lecture	SEQ/MCQ/VIVA
49	Understand all ceramic restoration, their uses and properties.	C1	Lecture	SEQ/MCQ/VIVA
50	Describe methods of strengthening ceramics.	C1	Lecture	SEQ/MCQ/VIVA
51	Understand the steps and methods involved in casting procedures.	C1	Lecture	SEQ/MCQ/VIVA
52	Prosthetic Polymers and Associated Materials Denture Base Resins - Denture Relining & Rebasement Materials - Tissue Conditioners Assessment items: 2 MCQ and 1 SAQ <p style="text-align: right;">By Dr. Salman Aziz</p>			
53	Understand the definition of a denture base material, understand their different types used and ideal properties and types of denture base materials	C1	Lecture	SEQ/MCQ/VIVA
54	Understand the chemical composition and properties of denture base materials.	C2	Lecture	SEQ/MCQ/VIVA
55	Understand the various procedures involved in the fabrication of denture base materials.	C1	Lecture	SEQ/MCQ/VIVA
56	Understand the clinical application, manipulation, processing, and care of dentures for laboratory processed prosthetic resins.	C1 P	Lecture / Practical	SEQ/MCQ/ VIVA/OSPE
57	Understand and describe biocompatibility issues associated with denture base materials.	C1	Lecture	SEQ/MCQ/VIVA
58	Describe various methods of polymerization of denture base materials.	C1	Lecture	SEQ/MCQ/VIVA
59	Understand relining and rebasing procedures for dentures.	C1	Lecture	SEQ/MCQ/VIVA
60	Describe various types of relining and rebasing dental materials.	C2	Lecture	SEQ/MCQ/VIVA
61	Describe manipulation and properties of relining and rebasing materials.	C2	Lecture / Practical	OSPE/VIVA
62	Understand biocompatibility issues associated with relining and rebasing materials in	C1	Lecture	SEQ/MCQ/VIVA
63	Understand the definition tissue conditioners.	C1	Lecture	SEQ/MCQ/VIVA
64	Understand various types of tissue conditioners used in dentistry.	C2	Lecture	SEQ/MCQ/VIVA
65	Understand and discuss the properties of various tissue conditioners used in dentistry.	C2	Lecture	SEQ/MCQ/VIVA

	Topic and Objectives	CPA	Learning Methods	Evaluation Methods
66	Understand the steps of clinical manipulation of tissue conditioners.	C2 P	Lecture / Practical	OSPE/VIVA
67	Impression Materials Assessment items: 5 MCQ and 1 SAQ			By Dr. Salman Aziz
68	Understand the significance of impression and impression materials in dentistry.	C1	Lecture	SEQ/MCQ/VIVA
69	Understand the general requirements for an ideal impression material	C1	Lecture	SEQ/MCQ/VIVA
70	Understand the classification, characteristics and properties of elastic and non-elastic impression materials.	C1	Lecture	SEQ/MCQ/VIVA
71	Compare the properties and clinical application of different types of impression materials.	C2	Lecture	SEQ/MCQ/VIVA
72	Understand and demonstrate proper technique for mixing, handling and manipulation of the elastic and non-elastic impression materials.	C1 P	Lecture / Practical	SEQ/MCQ/ VIVA/OSPE
73	Cements Assessment items: 4 MCQ and 1 SAQ			By Dr. Salman Aziz
74	Understand the objectives and basic terminologies related to dental cements.	C1	Lecture	SEQ/MCQ/VIVA
75	Understand the general requirements, types and properties of different dental cements.	C1	Lecture	SEQ/MCQ/VIVA
76	Understand and explain the setting mechanism of different dental cements.	C2	Lecture	SEQ/MCQ/VIVA
77	Understand and explain the properties, advantages and disadvantages of different dental cements.	C1	Lecture	SEQ/MCQ/VIVA
78	Understand and describe the clinical applications of different dental cements.	C1	Lecture	SEQ/MCQ/VIVA
79	Understand the concept of bases and liners for different clinical applications.	C2	Lecture	SEQ/MCQ/VIVA
80	Describe luting agents, types and their properties	C1	Lecture	SEQ/MCQ/VIVA
81	Understand the use of temporary restorative materials, properties and their uses.	C1	Lecture	SEQ/MCQ/VIVA
82	Demonstrate techniques for handling and manipulation of various dental cements.	C1 P	Practical	OSPE/VIVA

	Topic and Objectives	CPA	Learning Methods	Evaluation Methods
83	Define Atraumatic Restorative Technique (ART) and its uses	C1	Lecture	SEQ/MCQ/VIVA
84	Resin Based Materials Dentine Bonding Agents Assessment items: 5 MCQ and 1 SAQ			By Dr. Salman Aziz
85	Describe the history and classification of restorative composites.	C1	Lecture	SEQ/MCQ/VIVA
86	Understand and describe the properties of different components of restorative composites.	C1	Lecture	SEQ/MCQ/VIVA
87	Understand the clinical applications for composite restorative materials.	C2	Lecture	SEQ/MCQ/VIVA
88	Understand and explain different modifications in relation to restorative composites.	C2	Lecture	SEQ/MCQ/VIVA
89	Understand finishing and polishing procedures for restorative composites.	C1	Lecture	SEQ/MCQ/VIVA
90	Understand the biocompatibility issue related to restorative composites.	C1	Lecture	SEQ/MCQ/VIVA
91	Understand the recent advancements in restorative composites.	C1	Lecture	SEQ/MCQ/VIVA
92	Demonstrate clinical manipulation of restorative composites	C1 P	Practical	OSPE/VIVA
93	Understand the concept of bonding and adhesion in dentistry.	C1	Lecture	SEQ/MCQ/VIVA
94	Define enamel and dentine bonding.	C1	Lecture	SEQ/MCQ/VIVA
95	Understand the significance and rationale behind enamel and dentine bonding.	C1	Lecture	SEQ/MCQ/VIVA
96	Understand various types and generations of bonding agents.	C1	Lecture	SEQ/MCQ/VIVA
97	Understand the significance of biodegradation of restorative resins.	C2	Lecture	SEQ/MCQ/VIVA
98	Understand and explore recent advancements in dentin bonding agents.	C1	Lecture	SEQ/MCQ/VIVA
99	Dental Amalgam Assessment items: 2 MCQ and 1 SAQ			By Dr. Salman Aziz
100	Describe the history, composition and classification of dental amalgams.	C1	Lecture	SEQ/MCQ/VIVA

	Topic and Objectives	CPA	Learning Methods	Evaluation Methods
101	Understand the setting mechanism of different types of dental amalgams.	C1	Lecture / Practical	SEQ/MCQ/VIVA
102	Understand and explain the properties of dental amalgams.	C1	Lecture	SEQ/MCQ/VIVA
103	Understand and demonstrate clinical manipulation and factors affecting the properties of dental amalgams.	C2 P	Practical	VIVA/OSPE
104	Understand the issues related to amalgam hygiene in clinical practice.	C1	Lecture	SEQ/MCQ/VIVA
105	Explain the biocompatibility issues relating to dental amalgams.	C2	Lecture	SEQ/MCQ/VIVA
106	Identify recent advancements in dental amalgams.	C1	Lecture	SEQ/MCQ/VIVA
107	Miscellaneous Topics Assessment items: 2 MCQ and 0 SAQ By Dr. Salman Aziz, Dr. Usman Ashraf, Dr. Hammad Hassan, Dr. Ayesha Ashraf & Dr. Rabia Shafique			
108	Endodontic Materials			
109	Define endodontics and classify different endodontic materials used.	C1	Lecture	MCQ/VIVA
110	Understand steps involved in performing endodontic procedures.	C1	Lecture	MCQ/VIVA
111	Understand the use of different irrigants and lubricants used in endodontics.	C1	Lecture	MCQ/VIVA
112	Understand the use of various root canal medicaments	C1	Lecture	MCQ/VIVA
113	Understand different obturating materials.	C1	Lecture	MCQ/VIVA
114	Understand the role of mineral trioxide aggregate (MTA) and other retrograde filling materials.	C1	Lecture	MCQ/VIVA
115	Pit & Fissure Sealants			
116	Understand the composition, properties, manipulation and clinical application of pit and fissure sealants.	C1	Lecture	MCQ/VIVA/ OSPE
117	Fluoride Agents			
118	Understand and identify different types of fluoride agents, their mode of action and application.	C1	Lecture	MCQ/VIVA

	Topic and Objectives	CPA	Learning Methods	Evaluation Methods
119	Dentifrices			
120	Understand the types, composition and purpose of dentifrices and mouthwashes.	C1	Lecture	MCQ/VIVA
121	Separating Media			
122	Understand the rationale behind the use of separating media in dentistry	C1	Lecture	SEQ/MCQ/VIVA
123	Describe and identify various types of separating media used in dentistry, including their composition, mechanism of action and properties.	C1	Lecture	SEQ/MCQ/VIVA
124	Understand and demonstrate the steps involved in manipulation of separating media.	C2 P	Lecture / Practical	SEQ/MCQ/VIVA
125	Understand the techniques for application of a separating media.	C1	Lecture/ Practical	SEQ/MCQ/ VIVA/OSPE
126	Finishing & Polishing Materials			
127	Understand the objectives for finishing and polishing of dental restorations and prosthesis.	C1	Lecture	SEQ/MCQ/VIVA
128	Understand the classification, composition, properties of abrasives and clinical applications for finishing and polishing materials.	C1	Lecture	SEQ/MCQ/VIVA
129	Understand the principles of finishing and polishing of dental materials.	C1	Lecture	SEQ/MCQ/VIVA
130	Understand different types of cutting and abrasive instruments.	C2	Lecture	SEQ/MCQ/VIVA
131	Describe biological hazards associated with dental abrasive and polishing materials.	C1	Lecture	SEQ/MCQ/VIVA
132	Dental Implants			
133	Describe the history of implants in dentistry.	C1	Lecture	SEQ/MCQ/VIVA
134	Define osseointegration and its factors affecting it.	C1	Lecture	SEQ/MCQ/VIVA
135	Explain different types of implants used in dentistry.	C1	Lecture	SEQ/MCQ/VIVA
136	Understand materials used for dental implants.	C1	Lecture	SEQ/MCQ/VIVA

LEARNING OUTCOMES

INTRODUCTION

The subject of science of dental materials at undergraduate level enables the students to recognize the clinical, technical and scientific rationale for the use of materials in clinical dental practice. The course curriculum is designed to introduce dental materials science to students and facilitate their study of physical and chemical properties that are related to selection of these products by the dentist and to identify characteristics of materials that affect their biological safety. The practical component of the course involves hands-on experience of the materials and their manipulation in the laboratory.

SECTION I GENERAL CLASSES AND PROPERTIES OF DENTAL MATERIALS

This section introduces students to the general classification and brief overview of different types of preventive and restorative materials used in dentistry. It illustrates the terms and principles involved in describing the clinical behaviour of these materials based on their physical, chemical and mechanical properties. It also highlights the knowledge of appreciation of certain biological considerations for use of dental materials in oral cavity and hazards associated with them.

Aims

The section aims to provide basic background knowledge regarding structure of matter and to provide a comprehensive account of relationship between general properties of dental materials and their clinical performance. Another aspect of importance is the potential of this information to predict clinical performance under biological limitations and to allow the students to develop a critical understanding of the factors that determine the safe and correct use of materials in dentistry.

Learning outcomes

By the end of a unit, candidates will be able to:

- 1. Classification and overview of different preventive and restorative materials**
 - Understand basic classification of dental materials i.e. metals, ceramics, polymers and composites.
- 2. Structure of matter and principles of adhesion**
 - Describe the structure of matter and explain the principles of adhesion among dental materials

3. Physical and chemical properties related to material sciences

- Demonstrate knowledge of the fundamental biological, chemical and physical principles that make the foundation of the clinical behaviour and application of dental materials.

4. Surface chemistry

- Understand the principles involving surface interaction of dental materials in biological environment.

5. Biocompatibility

- Demonstrate knowledge of the range of biological consideration regarding the selection and performance of dental materials for clinical applications.
- Understand the knowledge of safety, biocompatibility and biomechanics as they relate to the correct clinical use of dental materials.

SECTION II DIRECT RESTORATIVE MATERIALS

This section familiarises students with a number of key themes and subjects regarding different types of direct restorative materials used in dentistry. It is designed to provide detailed information regarding historical background, types, properties, biological consideration, clinical applications, limitations and selection criteria of direct restorative materials.

Aims

The aim of this section is to allow students to develop scientific knowledge, understanding and competence in the area of direct restorative materials. Based on the information regarding their clinical behaviour and selection criteria students will be able to grasp the scientific rationale for use of these materials for their clinical applications.

Learning outcomes

By the end of a unit, candidates will be able to:

- Understand basic classification and types of direct restorative dental materials i.e. dental amalgam, dental cements and resin based composites.
- Understand the basic nature, classification, types, composition, properties and manipulation of direct restorative materials.

- Differentiate between the various types of direct restorative materials and their respective properties.
- Identify and manipulate different direct restorative materials commonly used in dentistry for restorative and lab procedures.
- Learn the process of selection criteria for direct restorative materials.
- Understand the risks and hazards associated with the use of direct restorative materials
- Understand the technological advances and current trends in direct restorative materials

1. Dental amalgam

- Describe the history, composition and classification of dental amalgams.
- Understand the setting mechanism of different types of dental amalgams.
- Understand and explain the properties of dental amalgams.
- Understand and demonstrate clinical manipulation and factors affecting the properties of dental amalgams.
- Understand the issues related to amalgam hygiene in clinical practice.
- Explain the biocompatibility issues relating to dental amalgams
- Identify recent advancements in dental amalgams

2. Dental cements

- Understand the objectives and basic terminologies related to dental cements.
- Understand the general requirements, types and properties of different dental cements.
- Understand and explain the setting mechanism of different dental cements.
- Understand and explain the properties, advantages and disadvantages of different dental cements.
- Understand and describe the clinical applications of different dental cements.
- Understand the concept of bases and liners for different clinical applications.
- Describe luting agents, types and their properties

- Understand the use of temporary restorative materials, properties and their uses.
- Demonstrate techniques for handling and manipulation of various dental cements.
- Define Atraumatic Restorative Technique (ART) and its uses

3. Restorative resin composite

- Describe the history and classification of restorative composites.
- Understand and describe the properties of different components of restorative composites.
- Understand the characteristics and clinical applications for composite restorative materials.
- Understand and explain different modifications in relation to restorative composites.
- Understand finishing and polishing procedures for restorative composites.
- Understand the biocompatibility issue related to restorative composites.
- Understand the recent advancements in restorative composites.
- Demonstrate clinical manipulation of restorative composites

4. Denting bonding agents and adhesive dentistry

- Understand the concept of bonding and adhesion in dentistry.
- Define enamel and dentine bonding.
- Understand the significance and rationale behind enamel and dentine bonding.
- Understand various types and generations of bonding agents.
- Understand the significance of biodegradation of restorative resins.
- Understand and explore recent advancements in dentin bonding agents.

SECTION III INDIRECT RESTORATIVE MATERIALS

The section covers detailed information regarding the physical, chemical, and biological properties, manipulation and handling characteristics of indirect restorative materials used in dentistry. This includes detailed study of scientific and clinical properties of materials such as dental acrylic resins, dental ceramics and metals used in restorative dentistry.

Aims

The aim of this section is to allow students to develop scientific knowledge, understanding and competence in the area of direct restorative materials. Based on the information regarding their clinical behaviour and selection criteria students will be able to grasp the scientific rationale for use of these materials for their clinical applications.

Learning outcomes

By the end of a unit, candidates will be able to:

- Understand basic classification and types of indirect restorative dental materials
- Understand the basic nature, classification, types, composition, properties and manipulation of indirect restorative materials.
- Differentiate between the various types of indirect restorative materials and their respective properties.
- Identify and manipulate different indirect restorative materials commonly used in dentistry for restorative and lab procedures.
- Learn the process selection criteria for indirect restorative materials.
- Understand the risks and hazards associated with the use of indirect restorative materials.
- Understand the technological advances and current trends regarding indirect restorative materials.

1. Denture base acrylic resins

- Understand the definition of denture base materials.
- Understand the ideal properties and types of denture base materials.
- Understand the chemical composition and properties of denture base materials.
- Understand the various procedures involved in the fabrication of denture base materials.
- Understand and discuss clinical application, manipulation, processing, and care of dentures for laboratory processed prosthetic resins.
- Understand and describe biocompatibility issues associated with denture base materials.
- Describe various methods of polymerisation of denture base materials.

2. Denture relining and rebasing materials

- Understand relining and rebasing procedures for dentures.
- Describe various types of relining and rebasing dental materials.
- Describe manipulation and properties of relining and rebasing materials.
- Understand biocompatibility issues associated with relining and rebasing materials in dentistry.

3. Tissue conditioners

- Understand the definition tissue conditioners.
- Understand various types of tissue conditioners used in dentistry.
- Understand and discuss the properties of various tissue conditioners used in dentistry.
- Understand the steps of clinical manipulation of tissue conditioners.

4. Dental ceramics

- Understand the basic chemistry and composition of ceramics.
- Understand the composition and classification of different dental ceramics systems.
- Understand general procedures involved in fabrication of dental ceramics.
- Understand the concept of metal ceramic bonding.
- Understand metal ceramic restorations, their uses and properties.
- Understand all ceramic restoration, their uses and properties.
- Describe methods of strengthening ceramics.

5. Metals used in dentistry

- Understand the basic concepts related to processing and solidification of dental alloys.
- Understand different types of metals and alloys used in fabrication of dental prosthesis.
- Understand the alloy phase diagrams.

- Explain the types, processing and clinical applications of high noble and noble metal alloys.
- Explain the types, processing and clinical applications of base metal alloys.
- Explain the casting procedures for metal alloys.
- Explain the types, processing and clinical applications of wrought metal alloys.
- Explain the types, processing and clinical applications of stainless steel in dentistry.
- Understand the significance and clinical applications for titanium and its alloys in dentistry.
- Describe the properties and composition of various orthodontic wires.

6. Soldering and welding

- Understand the objectives and uses of soldering and welding in dentistry.
- Understand the differences between soldering, brazing and welding.
- Describe the components of dental solders and welding.
- Understand different heat sources for soldering and welding.
- Understand welding and its types.

7. Dental implants

- Describe the history of implants in dentistry.
- Define osseointegration and its factors affecting it.
- Explain different types of implants used in dentistry.
- Understand materials used for dental implants.

SECTION IV AUXILIARY DENTAL MATERIALS

The section provides information regarding variety of auxiliary dental materials used in dentistry. Auxiliary dental materials include a range of materials that are involved in the fabrication of different dental prosthesis but that do not become part of the prosthesis.

Aims

The section aims to develop knowledge regarding basic features of auxiliary dental materials used in clinical and laboratory procedures. It involves the study of composition, properties, manipulation of auxiliary dental materials and the manner in which they interact with the environment in which they are applied.

Learning outcomes

By the end of a unit, candidates will be able to:

1. Gypsum products

- Understand the properties, types, uses, and manipulation of gypsum products.
- Understand the method of manufacturing and properties of gypsum products used in dentistry.
- Understand the setting reactions of different types of dental gypsum products.
- Understand the manipulation factors that affect the setting time and physical and mechanical properties of gypsum products.
- Understand and demonstrate the methods used for the disinfection of dental gypsum models and study casts.
- Understand and demonstrate the proper mixing technique of dental gypsum used for preparing study models and casts.

2. Impression materials

- Understand the significance of impression and impression materials in dentistry.
- Understand the general requirements for an ideal impression material
- Understand the classification, characteristics and properties of elastic and non-elastic impression materials.
- Compare the properties and clinical application of different types of impression materials.
- Understand and demonstrate proper technique for mixing, handling and manipulation of the elastic and non-elastic impression materials.

3. Dental waxes

- Understand the classification and types of waxes used in dentistry.
- Discuss the composition, properties and application of different types of dental waxes.
- Understand and demonstrate manipulation of different types of dental waxes.

4. Casting investments and casting procedures

- Define and explain investment materials used in dentistry.
- Understand different types of investment materials used in dentistry.
- Understand the composition, setting reaction and properties of gypsum bonded investment.
- Understand the composition, setting reaction and properties of phosphate bonded investment.
- Understand the composition, setting reaction and properties of silica bonded investment.
- Understand and compare properties and clinical applications of different types of investments.
- Understand the steps and methods involved in casting procedures.

5. Finishing and polishing materials

- Understand the objectives for finishing and polishing of dental restorations and prosthesis.
- Understand the classification, composition, properties of abrasives and clinical applications for finishing and polishing materials.
- Understand the principles of finishing and polishing of dental materials.
- Understand different types of cutting and abrasive instruments.
- Describe biological hazards associated with dental abrasive and polishing materials.

6. Separating media

- Understand the rationale behind the use of separating media in dentistry
- Describe and identify various types of separating media used in dentistry, including their composition, mechanism of action and properties.

- Understand and demonstrate the steps involved in manipulation of separating media.
- Understand the techniques for application of a separating media.

SECTION V PREVENTIVE DENTAL MATERIALS

The section deals with the introduction and knowledge of various preventive materials used in dentistry. It describes different types of preventive dental materials associated with mechanical tooth cleaning, plaque control, fluorides, and fissure sealants.

Aims

The section aims to introduce students to basic preventive dental materials used in clinical dentistry. It involves the study of composition, properties, manipulation of preventive dental materials and the criteria for proper selection for their clinical application.

Learning outcomes

By the end of a unit, candidates will be able to:

1. Dentifrices

- Understand the types, composition and purpose of dentifrices and mouthwashes.

2. Fluoride agents

- Understand and identify different types of fluoride agents, their mode of action and application.

3. Pit and fissure sealants

- Understand the composition, properties, manipulation and clinical application of pit and fissure sealants.

SECTION VI ENDODONTIC MATERIALS

The section focuses on the material used in endodontics that are used to irrigate and disinfect, obturate and seal the root canal system during endodontic treatment.

Aims

The section introduces students to different types of endodontic materials classified according to their intended clinical uses. It involves the study of composition, properties and mode of application of various disinfectants, lubricants, sealants and obturating materials used in endodontics.

Learning outcomes

By the end of a unit, candidates will be able to:

- Define endodontics and classify different endodontic materials used.
- Understand steps for performing endodontic procedures.
- Understand the use of different irrigants and lubricants used in endodontics.
- Understand the use of various root canal medicaments
- Understand different obturating materials.
- Understand the role of mineral trioxide aggregate (MTA) and other retrograde filling materials.

SECTION VII LABORATORY PRACTICALS

The practical component covers the manipulative and applied aspects of dental material science.

Aims

The laboratory practical component serves to familiarize students with the range of materials used in dentistry. It involves hands on experience with the materials so that students can understand issues related to dispensing, handling, manipulation and practical application of dental materials.

Learning outcomes

Upon completion, students should be able to identify different materials used in dentistry and understand the proper procedures for their manipulation, safety and infection control.

1. Introduction to laboratory equipment

- Identify and familiarise with instruments and equipment required for handling and manipulation of different dental materials in laboratory

2. Gypsum products

- Identify different types of gypsum products.
- Demonstrate the correct dispensing ratio of different gypsum products.
- Demonstrate the correct mixing technique for gypsum products.
- Making plaster slab.

3. Impression materials

- Identify different types of impression materials.
- Demonstrate the correct dispensing, manipulation and application of:
 - i. Alginate
 - ii. ZnO-eugenol paste
 - iii. Impression compound
 - iv. Elastomeric impression materials

4. Dental waxes

- Identify different types of dental waxes.
- Demonstrate the manipulation and application of different:
 - i. Pattern waxes
 - ii. Processing waxes
 - iii. Impression waxes

5. Acrylic resins

- Demonstrate the correct dispensing, manipulation and application of self-cure and heat-cure dental acrylic resin.

6. Dental amalgam

- Demonstrate the correct dispensing, trituration and application of dental amalgam.
- Demonstrate hand mixing and mechanical mixing of dental amalgam

7. Dental cements

- Identify different types of dental cements.
- Demonstrate the correct dispensing, mixing and application of:
 - i. Zinc phosphate cement
 - ii. Zinc oxide eugenol cement
 - iii. Glass ionomer cement
 - iv. Calcium hydroxide cement

8. Restorative composite resins

- Identify and familiarise with the armamentarium used for composite restorations i.e.
 - i. Visible light cure unit
 - ii. Acid etching gel
 - iii. Bonding agent
 - iv. Restorative composite
- Demonstration of different steps in composite restoration on extracted teeth.
- Demonstration of steps in sandwich technique on extracted teeth.

9. Metals and alloys

- Identification of different indirect metallic restorations
- Identification of different orthodontic wire used in dentistry

10. Dental ceramics

- Identification of different ceramic restorations

11. Investment materials

- Identification of different types of investment materials

12. Endodontic materials

- Identification of different endodontic materials used in dentistry

13. Finishing and polishing materials

- Identification of different abrasives used in finishing and polishing procedures.

LEARNING RESOURCES

<p>I. General classes and properties of dental materials</p>	<ol style="list-style-type: none"> 1. Anusavice, Kenneth J., Chiayi Shen, and H. Ralph Rawls. <i>Phillips' science of dental materials</i>. Elsevier Health Sciences, 2013. 12th Edition. 2. Powers, John M., and Ronald L. Sakaguchi. <i>Craig's restorative dental materials</i>, 13/e. Elsevier India, 2006. 3. McCabe, John F., and Angus WG Walls, eds. <i>Applied dental materials</i>. John Wiley & Sons, 2013.
<p>II. Direct restorative materials</p>	<ol style="list-style-type: none"> 1. Anusavice, Kenneth J., Chiayi Shen, and H. Ralph Rawls. <i>Phillips' science of dental materials</i>. Elsevier Health Sciences, 2013. 12th Edition. 2. Powers, John M., and Ronald L. Sakaguchi. <i>Craig's restorative dental materials</i>, 13/e. Elsevier India, 2006. 3. McCabe, John F., and Angus WG Walls, eds. <i>Applied dental materials</i>. John Wiley & Sons, 2013.
<p>III. Indirect restorative materials</p>	<ol style="list-style-type: none"> 1. Anusavice, Kenneth J., Chiayi Shen, and H. Ralph Rawls. <i>Phillips' science of dental materials</i>. Elsevier Health Sciences, 2013. 12th Edition. 2. Powers, John M., and Ronald L. Sakaguchi. <i>Craig's restorative dental materials</i>, 13/e. Elsevier India, 2006. 3. McCabe, John F., and Angus WG Walls, eds. <i>Applied dental materials</i>. John Wiley & Sons, 2013.

<p>IV. Auxillary dental materials</p>	<ol style="list-style-type: none"> 1. Anusavice, Kenneth J., Chiayi Shen, and H. Ralph Rawls. <i>Phillips' science of dental materials</i>. Elsevier Health Sciences, 2013. 12th Edition. 2. Powers, John M., and Ronald L. Sakaguchi. <i>Craig's restorative dental materials</i>, 13/e. Elsevier India, 2006. 3. McCabe, John F, and Angus WG Walls, eds. <i>Applied dental materials</i>. John Wiley & Sons, 2013.
<p>V. Preventive dental materials</p>	<ol style="list-style-type: none"> 1. Anusavice, Kenneth J., Chiayi Shen, and H. Ralph Rawls. <i>Phillips' science of dental materials</i>. Elsevier Health Sciences, 2013. 12th Edition. 2. Powers, John M., and Ronald L. Sakaguchi. <i>Craig's restorative dental materials</i>, 13/e. Elsevier India, 2006. 3. McCabe, John F, and Angus WG Walls, eds. <i>Applied dental materials</i>. John Wiley & Sons, 2013.
<p>VI. Endodontic materials</p>	<ol style="list-style-type: none"> 1. Anusavice, Kenneth J., Chiayi Shen, and H. Ralph Rawls. <i>Phillips' science of dental materials</i>. Elsevier Health Sciences, 2013. 12th Edition. 2. Powers, John M., and Ronald L. Sakaguchi. <i>Craig's restorative dental materials</i>, 13/e. Elsevier India, 2006. 3. McCabe, John F, and Angus WG Walls, eds. <i>Applied dental materials</i>. John Wiley & Sons, 2013.

OTHER LEARNING RESOURCES

Laboratory Demonstrations/ Hands-on activity	The laboratory demonstrations familiarize students with the clinical application of different materials used in dentistry. It provides hands on experience for the students to understand and practice dispensing, handling, manipulation and practical application of dental materials
Videos	Videos related to the dispensing, handling and correct application of various dental materials are used to introduce the practical aspect of science of dental materials
Self Learning	Self-learning enables the student drive their own learning process. Students are directed to search the information from different resources in order to prepare for small group discussions and tutorials.

SUMMATIVE ASSESSMENT METHODS AND POLICIES

Internal Assessment (IA)

- a. Weightage of internal assessment shall be 20 %, each for theory and practical, in BDS Professional Examination.
- b. The Internal Assessment shall comprise of monthly test / assignments / class presentation / send-ups /class tests / OSPE etc.
- c. 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.
- d. The result of all the class tests / tools which contribute towards IA will be displayed to the students during an academic year.
- e. 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
- f. Internal assessment tools of any subject may be changed after the approval of respective FBS

Annual Examination

- a. The weightage of Annual Examination shall be 80%, each for theory and practical, in BDS.
- b. The examination comprises of a theory paper and practical/clinical examinations as per PMC regulations and the Table of Specifications (TOS) of the University.
- c. The gap between two consecutive theory papers shall not be more than two days.
- d. The Theory Paper shall be of 3-hours duration, held under the arrangements of the university. It shall have two parts; MCQs and SAQs for the year 2022. It may be changed after the approval of Academic Council.

• Internal Examiner

He/she shall be Associate Professor/Professor and Head of Department who has been involved in teaching of the class being examined for at least six months and has delivered 50% of the total lectures. 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 recognised Professor of the subject.

- **External Examiner**

He/she shall be a Professor/Associate Professor of a recognised 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**

- a. 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.
- b. 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)
- c. The Controller of Examinations shall approve the faculty for the final paper setting having fair representation of each college / institute

- **Paper Assessment**

- a. The Controller of Examinations shall approve the faculty for the theory paper marking, to be undertaken in the manner as deemed appropriate.
- b. The Examination Directorate shall coordinate directly with the faculty, earmarked for the paper marking
- c. A student who scores 85% and above marks in any subject shall qualify for distinction in that particular subject.
- d. 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**

- a. The Controller of Examinations shall approve the faculty to serve as the internal & external examiners.
- b. The number of external and internal examiners shall be equal.
- c. One external& internal examiner each shall be marked for a group of 100 students.

- d. Candidates may be divided into groups practical examinations and be standardised by incorporating OSPE stations.
- e. 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.
- f. 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**

- a. Pass marks for all subjects shall be 50 % in theory and practical, separately.
- b. 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

Second Professional BDS Examination

SCIENCE OF DENTAL MATERIALS

TOS for Second Annual Professional Examination: Theory

Marks of Written Paper= 80
Marks of Int. Asses= 20
Max Marks= 100
Pass Marks = 50

Time Allowed = 03 hours
(Including MCQs)
Date:

40 x MCQs (on separate sheet) (40 Marks) (Time = 30 min)
08 x SAQs/ SEQs (C1 & C2) = 05 marks each (40 Marks) (Time = 2hrs 30 min)

Sr. no	Topic	No. of MCQs (40) (C1 = 23, C2 = 12, C3 = 5) 01 mark each	No. of SAQs 07 x SAQs ((C1 & C2) = 5 marks each 01 x SAQs (C3) = 05 marks
1	General classes and properties of dental materials	6	1
2	Waxes, Gypsum products and Investment materials	4	1
3	Metals in Dentistry	6	
4	Ceramics and Casting procedures for PFM prosthesis	4	1
5	Prosthetic polymers and associated materials	2	1
6	Impression Materials	5	1
7	Cements	4	1
8	Resin Based Materials	5	1
9	Dental Amalgam	2	1
10	Miscellaneous Topics	2	
	Total	40 (40 marks)	08 (40 marks)
	Grand Total	80 marks	

Internal Assessment Calculation (Theory Annual)

A	B	C	D
Roll no.	Name	All Modules Pre annual Exams or any other exam	Total Marks of Internal Assessment out of 20
Total Marks		Sum of Marks obtained x 20 / sum of total marks in all exams	

Table of Specifications for Annual Professional Exam: Practical

VIVA 40 marks		Practical (OSPE) 40 marks			Total
Examiner I	Examiner 2	OSPE Total = 30	Wire work Total = 5	Plaster slab Total = 5	
20 marks	20 marks	40 marks			80 marks

Internal Assessment Calculation (Practical)

A	B	C	D
Roll no.	Name	OSPE/ PTT/ Class tests though out the year/ Pre annual Exams or any other exam	Total Marks of Internal assessment Out of 20
Total Marks		Sum of Marks obtained x 20 / sum of total marks in all exams	

SAMPLE THEORY PAPER QUESTIONS

Sample MCQ

A rheological effect of metals and other solid materials that may become plastically deformed as a result of a load being applied for a long period:

- a) Fatigue strength
- b) Toughness
- c) Resilience
- d) Creep

Key: d

Short Essay Questions (SEQs)

- Short essay questions require students to present written answers that are used to assess basic knowledge of key facts and provide students with an opportunity to demonstrate reasoning and explain their understanding of the subject.

Sample SEQ

- Q. a)** Classify gypsum products. Enumerate the factors that control setting time of gypsum (4)
- b)** Write the composition of dental stone plaster (3)

Key:

a) Classification:

Type I Impression plaster

Type II Model plaster

Type III Dental stone

Type IV Dental stone, High strength

Type V Dental stone, High strength High expansion

Factors affecting setting time of gypsum:

1. Water/powder ratio
2. Temperature
3. Speed of spatulation
4. Aging
5. Particle size
6. Impurities
7. Retarders

b) Composition:

Calcium sulphate hemihydrate Main ingredient

Potassium sulphate Accelerator, Anti-expansion agent

Borax Retarder

Alizarin red Coloring agent

Gum tragacanth Improve cohesiveness

Starch Soluble plaster