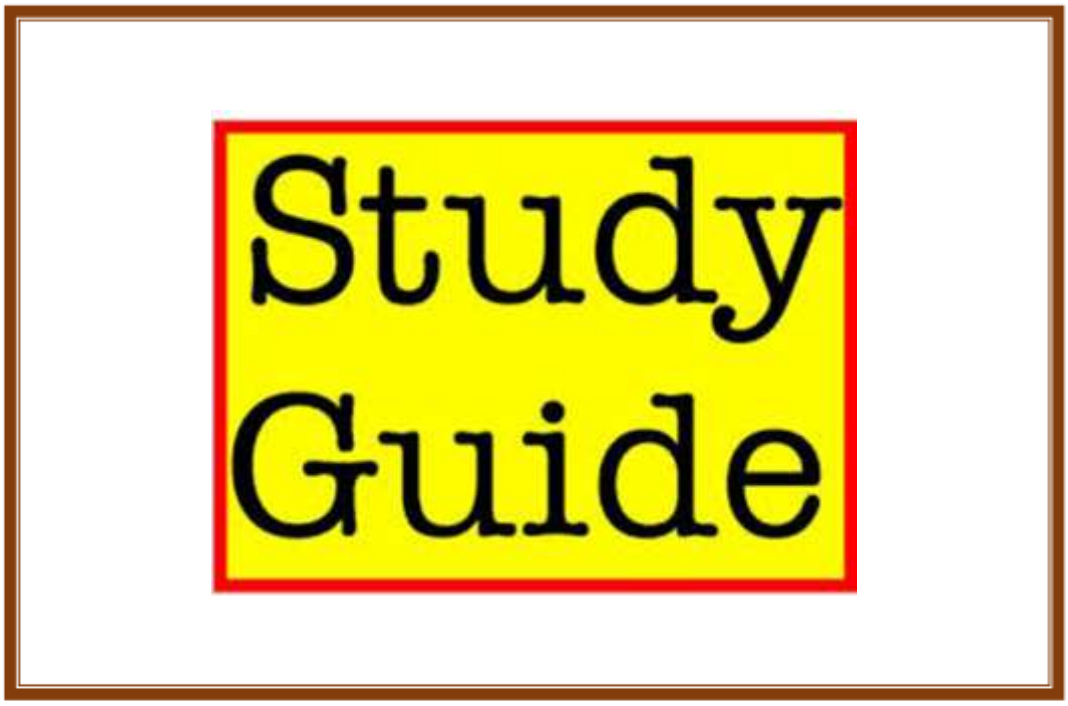
Department of Science of Dental Materials



BDS 2ND YEAR
SESSION 2023-24

Akhtar Saeed Medical & Dental College

DEPARTMENT OF SCIENCE OF DENTAL MATERIALS

Message from Head of Department

Dear students,

I am Dr. Zenab Sarfraz, HOD of Science of Dental Materials that will be taught to you in 2ND year BDS.

You will find this study guide very useful as it will provide you with complete guidance to the detailed course content, learning objectives, text books and assessment methods you will be required to go through.

This guide has been complied with the intention of being your companion throughout the year so you may get an insight of what is essential to know and perform. It covers all the required topics along with their clinical applications and this will serve as a back bone to constructing good clinical proficiency and decision making as you enter your clinical years.

My department and I welcome you aboard and sincerely hope you become knowledgeable, competent and skillful doctors in the future.

Best of Luck!!

APPROVAL FOR THE COURSE

This course has been reviewed, revised and approved by

- Pakistan Medical and Dental Council
- University of Health Sciences
- College Curriculum Committee

DEPARTMENT OF SCIENCE OF DENTAL MATERIALS

GENERAL COURSE INFORMATION

Course Title	SCIENCE OF DENTAL MATERIALS		
Course Components	Theory Marks: 100	Practical Marks: 100	
PRE-REQUISITES	General Anatomy	Human Physiology	Biochemistry
REQUISTIES	Prosthodontics Operative Dentistry		
YEAR	2ND Year BDS		

TABLE OF CONTENTS

DEPARTMENT OF SCIENCE OF DENTAL MATERIALS

COURSE DESCRIPTION

The Science of Dental Materials is an applied basic science pertaining to the study of mechanical, physical, biological and chemical properties of materials used in dentistry, emphasizing on materials in association with both clinical and non-clinical aspects.

It encompasses study of composition, manipulative techniques, applications of dental materials and the way in which they interact with the oral environment in which they are placed. An understanding of these properties as well as their handling is critical to the selection of dental materials in the field of dentistry.

COURSE OBJECTIVES:

To provide both the scientific background and the practical skills required by students to make the best use of novel and available materials. The course begins with an introduction to the major classes of materials used in dentistry including polymers, metals and ceramics and restorative materials with their properties, manipulation, chemistry, testing methods and subsequent clinical application

FACULTY OF DENTAL MATERIALS DEPARTMENT

Name	Designation
DR. ZENAB SARFRAZ	HOD & Associate Professor
DR. MUHAMMAD MUSBAH SHAHEEN	Demonstrator & Lab incharge / Coordinator
DR. TASEER MALKERA	Demonstrator & Lab incharge / Coordinator
MUHAMMAD FASIAL HANEEF	Lab Assistant

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What is a study guide??

A study guide is a concise outline of what you are expected to know in order to gain sufficient knowledge and skill to pass your Professional exam.

Objectives:

- To inform students how student learning program has been organized according to their learning objectives.
- Help students organize and manage their studies throughout the course.
- Guide students on assessment methods, rules and regulations
- Communicates information on organization and management of the course. This will help the student to contact the right person in case of any difficulty.
- Defines the objectives which are expected to be achieved at the end of the course.
- Identifies the learning strategies such as lectures, small group teachings, clinical skills, demonstration, tutorial and case-based learning that will be implemented to achieve the course objectives.
- Provides a list of learning resources such as books, computer assisted learning programs, web- links, journals, for students to consult in order to maximize their learning.

What are good study skills?

- Time management
- Take notes and revise before the next lecture
- Speak Out Loud Instead of Simply Reading.
- Write and rewrite to memorize efficiently
- Make Mnemonics
- Teach What You Have Learned. Group study!!
- Create Mental Associations.
- Draw Diagrams/flow charts

- Watch videos on relevant topic
- Solve past University questions (SEQS) and attempt MCQS from different MCQ books

TEACHING STRATEGIES

- Weekly Lectures
- Weekly Tutorial
- Weekly practical and preclinical demonstrations
- Audio-visual aids
- Self-Directed learning
- Team/group-based learning

ASSESMENT STRATEGIES

- Classroom participation
- Monthly tests
- Term Test
- Assignments
- Presentations
- Surprise quizzes
- Viva Voce
- OSPE

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RULES AND REGULATIONS

- Maintain discipline and conduct during lectures.
- Students must report on time to lectures, those coming later than 10 minutes will be marked absent.
- Two late attendance= 1 absent
- Attendance is mandatory, students with less than 75% attendance will not be allowed to sit in monthly tests nor 2ND Professional Examination
- Students failing more than 3 monthly tests will not be allowed to appear in 2ND Professional examination.
- Students being absent from monthly exam without prior notice and valid reason will be fined by administration.
- Leave will only be granted upon presenting written and signed application by parents.
- Eating, drinking and smoking is prohibited during class
- Mobile phones should be switched off; no leniency will be shown to those engaged in texting or any sort of mobile usage.
- Students found guilty of cheating or engaging in illegal means of attempting test will be dealt strictly and disciplinary action will be taken immediately
- Do not leave your valuables or instruments unattended.
- Regarding Lab Procedures: Students should complete weekly tasks
- Lab coats are mandatory during all lab procedures.
- Students are instructed to maintain and get their lab books signed regularly
- Students should purchase and bring their own instruments.
- Noncompliance or violation of rules will lead to serious consequences

DENTAL MATERIALS SYLLABUS

SCIENCE OF DENTAL MATERIALS

Introduction to dental materials:
Physical properties of dental materials
Thermal and electrical properties of dental materials
Mechanical properties i.e. stress, strain, stress/ strain relationship and other related properti
Biocompatibility

A comprehensive understanding of the composition, properties, setting reactio manipulation, application and adverse effects of dental materials is required and t following materials are important in this regard:

Impression materials – classification, types
Gypsum product – model and Die materials
Investment materials – casting and casting defects.
Dental waxes
Separating media used in dentistry
Polymers:
Non metallic denture base materials
Tissue conditioning materials and soft liner.
Amalgam – types, composition, mercury toxity.
Composites – development, types, acid etching
Compomers
Glass ionomers
Dental cements – different classes and usage.
Adhesives and dentin bonding materials
Materials used in endodontics
Metals and alloys – gold, Cobalt Chromium, Nicked – Chromium
Steel and Stainless steel & other wire materials,

- Ceramic materials – porcelain, metal fused porcelain, castable ceramics
- Abrasive and polishing materials
- Dental implant materials
- Soldering, welding, generals principles.

Laboratory Assignments:

Identification of all dental materials
Manipulation of dental plasters
Exercises in acrylic partial dentures

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Sr #	Contents	Learning Objectives
1	Introduction And Properties Of Dental Materials	Students should be able to: • Explain What Are Dental materials? Their applications and brief history. • Classification of dental materials on their basis of chemistry • Understand and explain with Clinical significance: ➢ Physical properties of materials including hardness, abrasion, erosion ➢ Thermal, Chemical and other related properties of Dental Materials ➢ Rheological Properties ➢ Optical properties ➢ Mechanical properties i.e. stress, strain, and all other related properties.
2	Gypsum And Its Products	Student should be able to: • Classify the gypsum products • Explain the composition of gypsum • Describe the chemistry of setting of gypsum when mixed with water • Enlist the associated properties and clinical applications of gypsum products
3	Impression Materials	Student should be able to: • Classify and identify the impression materials according to their elasticity as well as functions. • Describe the requirements of impression materials and simple impressing taking techniques. • Describe the importance of Accuracy and dimensional stability especially in hydrocolloids and the factors associated with them.

		• Understand the composition, properties, advantages/disadvantages, applications and setting reaction of all impression materials both elastic and inelastic • Compare and contrast between the properties of impression materials and know their clinical uses
4	Polymers and Denture base resins	Student should be able to: • Explain the requirements of denture base material. • Register the Properties of acrylic resin as a denture base material, their composition, manipulation and processing techniques. • Describe the different curing techniques and associated errors in denture making • Identify the types of Artificial teeth and their properties • Understand Denture repair, relining and rebasing materials. • Know what are Tissue conditioners and soft liners. Enlist the available materials
5	Dental Waxes	Student should be able to: • Name and classify the dental waxes according to their use • Describe the properties particular to dental waxes as well as composition and uses of Base plate wax, Casting and Inlay waxes
6	Casting and Investment	Student should be able to: • Comprehend the casting technique and associated processing errors • Explain the Three main investment materials, their composition, properties as well as uses

7	Abrasives and polishing agents	Student should be able to: • Recognize the available abrasive and polishing agents and differentiate between them according to their sources • Understand the principal and types of abrasion • Have knowledge about cutting, finishing and polishing and its importance with respect to final restoration • Realize the potential biological hazards of finishing and polishing and the precautions that must be taken to minimize these effects
8	Dental Ceramics	Student should be able to: • Understand what are dental ceramics, their manufacturing techniques and firing process • Enlist the properties of dental ceramics along with associated clinical applications • Explain the strengthening mechanisms of dental ceramics
9	Adhesion and Bonding	Student should be able to: • Understand the principle of adhesion and factors associated. • Describe the concepts of enamel and dentine bonding • Explain what is acid etching, its steps and applications in dental procedures • Enlist the different bonding systems with their pros and cons

10	Dental Restorative Resins	Student should be able to: • Define what are composites, their constituents and associated properties and functions • Classify composites according to filler particle size as well as curing technique • Explain the steps of composite filling and its manipulation • Understand the mechanism of polymerization shrinkage and the techniques that may be used to minimize it • Compare the properties of composites with amalgam
11	Dental cements: Zinc phosphate cements. Zinc oxide/ Eugenol, modified zinc oxide/ Eugenol, ethoxy benzoic acid cement zinc polycarboxylate, Conventional and modified Glass ionomer cement Cavity varnish, cavity liners, calcium hydroxide, Endodontic irrigants, sealant, gutta purcha, MTA	Student should be able to: • Explain the terminologies Lining, base and luting agents and the importance of W/P ratio and film thickness in accordance. • Describe the ideal requirements of cements • Understand the composition, setting chemistry, properties as well as applications of all the specified dental cements. • Differentiate between the properties of GIC and its modifications

12	Metallurgy	Student should be able to: • Describe the general properties of Pure metals and their alloys. Types of alloys and their uses in dentistry • Explain the principle of Cold working and annealing and their effect on metal alloy • Define Welding, brazing and soldering. • Distinguish between Tarnish and corrosion and their types. Know the clinical significance of this phenomena • Classify the direct gold fillings and know the general properties as well as manipulation of gold filling. • Enumerate the Dental casting gold alloys, their composition, properties and uses. • Enlist the Base metal casting alloys, their composition, uses, properties and comparison with casting gold alloys. • Have knowledge about the Wrought alloys, their composition, properties and uses • Compare the properties of different orthodontic wire materials

13	Dental Amalgam	Student should be able to: • Define what is amalgam and its composition. • Classify the different amalgam alloys and their properties • Explain the amalgamation process • Describe the setting chemistry of different amalgam types with emphasis on the stoichiometric phases being formed. • Explain in detail the steps of amalgam manipulation and restoration • Understand the phenomena of creep and causes of amalgam failure • Have knowledge about mercury toxicity, its biological effects as well as proper disposal
14	Dental Implants and Tissue engineering	Students should be able to: • Define what are dental implants • Understand the components of dental implants • Know the indications and contra indications of Dental Implants • Explain the available materials and surface coatings of Implants • Differentiate between ''osteointegration and bio integration''

DEPARTMENT OF SCIENCE OF DENTAL MATERIALS

TABLE OF SPECIFICATIONS (TOS) ACCORDING TO UHS:

Topics	MCQs (45)	SEQs (15)
1-Introduction and Properties of Dental Materials:	2	1
2-Gypsum and Its Products	2	1
3- Waxes	1	1
4- Impression materials	5	1
5- Polymers and Denture base resins	3	1
6-Casting investments	2	1
7-Abrasives and polishing agents	2	1
8-Dental ceramics	4	1
9-Adhesion and Bonding	4	1
10-Restorative resins/Dental Composites		
11-Dental Amalgam.	3	1
12-Dental Cements/Endodontic/Preventive materials	4	1
13-Glass Ionomer cements	4	1
14-Direct Filling Gold	1	1
15-Casting alloys	4	1
16-Soldering/welding	3	1
17-Wrought alloys		
18-Dental Implants and tissue Engineering	1	1
Total	45	15

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SOURCE OF KNOWLEDGE:

1) RECOMMENDED BOOKS:

   a) Restorative Dental Material by Robert G. Craig and John M. Power.
   b) Applied Dental Materials by Mc Cabe
   c) Notes on Dental Materials by E. C. Combe
   d) Philip's Science of Dental Materials
   e) Textbook of Dental Materials by Sharmila Hussain

2) ONLINE SOURCES:

   - Whats-app group
   - Facebook group
   - PDF of recommended books

3) HAND OUTS

4) SPRING/SUMMER VACATION HOME WORK

   - Assignments
   - Power point group presentations
   - Past UQ papers

5) VIDEOS

6) PRESENTATIONS/MULTI MEDIA SLIDES

FACILITIES

The Dental Materials laboratory occupies 500 square foot on the 3rd floor of medical college building at the Akhtar Saeed Medical and Dental College.

The facilities include state of the art laboratory equipped with latest dental equipment and materials along with head of department office with internet connectivity and online resources.

All students have access to latest dental equipment as well as materials to get trained in clinical as well as laboratory techniques and procedures.

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LIST OF PRACTICALS FOR OSPE

1. Identification of dental materials, lab instruments and equipment

2. Manipulation of soft plaster
   - Demonstration
   - Mixing
   - Pouring

3. Manipulation of Acrylic Resin.
   - Demonstration
   - Dispensing and Manipulation.
   - Identification of different stages during setting

4. Alginate Impression taking.
   - Demonstration
   - Dispensing and Manipulation
   - Tray adaptation

5. Manipulation of Additional Silicone Heavy Body (Putty Impression)
   - Demonstration
   - Dispensing of Base and Catalyst Paste
   - Kneading of Both Paste till Homogenous Color and Consistency Achieved
   - Adaptation on Tray
   - Impression Taking

6.Manipulation of Additional Silicone Light Body (Wash Impression)
   - Demonstration
   - Base and Catalyst Paste inserted into Auto mixed gun
   - Dispensing of Base and Catalyst Paste on putty (heavy body) impression
   - Impression taken on prepared tooth

7.Manipulation of Impression Compound.

- Demonstration
- Dispensing and Manipulation
- Tray adaptation

8. Manipulation of Zinc Oxide Eugenol- Impression Paste

- Demonstration
- Dispensing and Manipulation

9. Manipulation of Amalgam

- Demonstration
- Dispensing
- Trituration
- Achieving ideal consistency

10. Manipulation of Dental Cements:

- Zinc Phosphate
- Zinc Oxide eugenol
- GIC – luting and restorative
- CAOH

11. Manipulation of Light Cure Resin Composite

- Demonstration

12. Wire bending

- Alphabets- ''S'' and ''C'' (Demonstration and practical

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STUDENTS INTERNAL ASSESSMENT REPORT

Photograph

1. Name of the Student: _____
2. Roll No: _____
3. Father's Name: _____
4. Session: _____

5. Subject of DENTAL MATERIALS Attendance:

a) Theory: _____
b) Practical's: _____

6. Academic Performance:

Result of Tests taken

a) _____
b) _____
c) _____
d) _____
e) _____
f) _____

7. Send up Examination
8. Assessment Score
9. General Conduct

DEPARTMENT OF SCIENCE OF DENTAL MATERIALS

POLICY OF INTERNAL ASSESSMENT OF DENTAL MATERIALS

1) Continuous internal assessment consists of appropriate evaluation at the end of each assignment, term, major/monthly test or course of the curriculum. Proper records of internal evaluations should be maintained and the scores obtained in these tests should contribute 10% to the final total score of the candidates; that 10% may include class tests, monthly test, assignments, presentations and send-up examination.
2) Final university examination of each subject should contribute 90% to the total score, and the students should secure passing marks on the aggregate of the total marks.
3) 10% marks of internal evaluation will be added in theory of semester exam. Students should know what is expected of them. They should be able to identify the characteristics of a satisfactory answer and understand the relative importance of those characteristics. This can be achieved in many ways; you can provide feedback on assignments, describe your expectations in class, or post model solutions.
4) No grace marks should be allowed in any examination.
5) Written examinations consist of MCQ's, short structured essays, (according to curriculum) questions.
6) During the course, students will be assessed to determine achievement of course objectives. The test will be scheduled on completion of each chapter. The method of examination comprises of theory exam which includes SEQS, MCQS, practical (Objective Structured Practical Examination) and Viva voce.

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NUMBERS OF MARKS ALLOCATED FOR UNIVERSITY EXAMINATION AND INTERNAL ASSESSMENT

UNIVERSITY EXAMINATION Marks (UHS)	INTERNAL EVALUATION (Class tests + Term tests + Log book)	TOTAL Theory
80%	20%	100%

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DISTRIBUTION OF MARKS FOR 2nd Prof BDS EXAMS EVALUATION

The method of examination and distribution of 200 marks shall be as follows:

1. WRITTEN EXAMINATION: Total Marks - 90
   - One paper of 45 marks comprising of an MCQ section of mark (45 MCQs of 1 mark each)
   - SEQ section of 45 marks (15 SEQs of marks each) and
   - 10 marks 0f internal assessment
2. PRACTICAL EXAMINATION: VIVA VOCE+OSPE MARKS - 90

SCIENCE OF DENTAL MATERIALS:

The Viva Voce shall only carry 50 Marks (25 with Internal Examiner and 25 with External Examiner). 40 Marks will be dedicated to OSPE as per following formula:

Observed Stations (05 Minutes at each Station)	20 Marks (5 Stations)
Non-Observed Stations (05 Minutes at each Station)	20 Marks (5 Stations)

(ToS of OSPE shall be provided by the Curriculum Review Committee within ONE Month)

The Internal and External Examiner shall sit together. On any given day of examination, the Examiners will divide topics between them but shall award marks to all responses of the candidate to questions asked by both. The awards shall be sent to the Examinations Department separately by the TWO examiners. Each Candidate shall be given at least 10-15 minutes for this component of Examination during which the Examiners between themselves shall cover the entire subject.

*** Internal Assessment will be calculated and given out of 20 marks from both theory and practical and added to the Annual Result**

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INTERNAL ASSESSMENT OF BDS 2ND YEAR

Criteria	Marks Distribution
MONTHLY TESTS	12
TERM TEST	2
LOG BOOK	5
GENERAL CONDUCT	1
TOTAL	20