Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad

Curriculum
M.Phil Dental Materials

ROAD MAP OF MPHIL DENTAL MATERIALS (A BRIEF SUMMARY)

GENERAL INFORMATION AND PROGRAM GOALS

M.Phil Dental Materials is a two years full-time program which intends to attract candidates that have an interest in the multidisciplinary field of Biomaterials especially those related to Dental Materials and associated research techniques. The curriculum focuses on formal teaching & training as well as laboratory work and biomaterials research.

The program's aim is to train and equip the post-graduate students with all the necessary knowledge & skills, at par with international standards, required to be a leader in the field of Dental Materials Science.

Curriculum Development Committee

Prof Dr. Shahab Ud Din
PhD (London), MSc. (London), BDS (Pb)
Professor and HoD
Science of Dental Materials, School of Dentistry (SoD)
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Senior Registrar
Rawal Institute of Health Sciences, Islamabad

Course Description

The program will consist of sixty-four (64) credit hours of various courses distributed over a span of two academic years. That would include almost 52 credit hours of coursework including the specialty courses and 12 credit hours for research project. This could be in the form of formal teaching/contact sessions, Problem Based Learning (PBL), journal club meetings, skills laboratory experience and biomaterials research techniques.

REQUIREMENTS FOR GRADUATE STUDENTS ENROLLED IN THE MPHIL PROGRAM

- Fulfilment of University requirements for postgraduate study.
- Two (02) years of consecutive full-time advanced study and training
- Complete and approved master's thesis based on original research during the course of study in an area related to field of dentistry, suitable for publication in a reputable dental journal.
- Must complete all course & research work in the required curriculum and satisfactorily pass all the University examinations.

MPhil Dental Materials Program

Introduction

Materials are at the forefront of new technologies in medicine and dentistry, both in preventative and restorative treatment. The MPhil Dental Materials program will be covered over a span of two years. The program features a fresh perspective on opportunities that are available in the field of Biomaterials and Dental Materials Sciences and will provide up-to-date information on dental materials currently used in clinical dentistry.

The advanced training program in Dental Materials is designed to develop a broad knowledge of the underlying principles of functional properties of dental materials, their bioactivity and biocompatibility, and will also cover specific biomaterial applications such as drug delivery, tissue engineering, and regulatory affairs. The program's aim is to train and equip the post-graduate students with all the necessary knowledge & skills, at par with international standards, required to be a leader in the field of Dental Materials Science. The curriculum focuses on formal teaching & training along with dental laboratory practical work and advanced research in biomaterials.

The candidates, upon graduation, will be expected to demonstrate a high level of expertise in the field of Dental Materials Science with a more specific focus on clinical aspects of dental materials as well as a multidisciplinary approach towards the development of novel dental biomaterials. The training has been based on the current thinking and the requirements for;

- Producing a competent workforce with the appropriate skills and knowledge necessary to carry out laboratory-based research on dental biomaterials for

specific clinical applications

- Greater protection of the public interest by providing clear information as to the level of training achieved
- Greater flexibility of training through the availability of multiple instructors
- Acquire the experience to carry out research projects, critically evaluate scientific publications and communicate research papers in journals and conferences.
- Inculcating self-awareness and self-directed learning abilities in the candidates and future dental material scientists.

EDUCATIONAL OBJECTIVES:

- Acquire adequate knowledge of related subjects of Biomaterials sciences in order to have a broad-based concept of dental materials
- Sound knowledge of specific biomaterial applications such as drug delivery, tissue engineering & regenerative medicine and regulatory affairs
- Be able to place special emphasis on materials-structure correlations in the context of both clinical and non-clinical applications
- Understand research problems and be able to plan and carryout research independently

ENTRY CRITERIA:

ELIGIBILITY TO APPLY FOR MPHIL DENTAL MATERIALS PROGRAM

1. Fully registered dental graduates (BDS degree or equivalent recognized by PM & DC)
2. One-year foundation training/house job

CRITERIA FOR ADMISSION

1. Entry examination by University
2. The shortlisted candidates for MPhil programs will be interviewed by the respective Supervisory Committee.
3. Valid TOEFL score for foreign graduates

MM.Phil Ist Year – Course Content

TOS ID	Subjects	Code	Topics	Credit Hours
DM-01	**Dental Materials**	1.1	Materials Research Techniques	2
		1.2	Occupational Hazards	1
		1.3	Gypsum Products	1
		1.4	Dental Polymers	1
		1.5	Acrylic Resins	1
		1.6	Resin Composites	1
		1.7	Impression Materials	1
		1.8	Dental Cements	1.5
		1.9	Dental Amalgam	1
		1.10	Microstructure & Solidification in Metals & Alloys	1
		1.11	Dental Waxes	1
		1.12	Casting Procedure	1
		1.13	Dental Ceramics	1
		1.14	Endodontic Materials	1
		1.15	Dental Implants	0.5
		1.16	Adhesion and Bonding in Dentistry	1
		1.17	Polishing & Finishing Materials	0.5
DM-01 Total Credit Hours				**17.5**
DM-02	**Advanced Dental Materials**	2.1	Advancements in Glass Ionomer Cements	2
		2.2	Biofunctionalization of titanium for dental implant	1.5
		2.3	Compositional Characteristics and Hydration Mineral Trioxide Aggregate (MTA)	1

		2.4	Aging and Stability of Bonded Interface in Dentistry	2
		2.5	Fibre Reinforced Composites	2
		2.6	Indications of fissure sealants and their role in children and adolescents	1
		2.7	Nanotechnology in Dental Sciences	3
		2.8	Recent advancements in the development of GTR/GBR membranes for periodontal regenerations	2
DM-02 Total Credit Hours				**14.5**

Mid Term Assessment (MTA)

a. The M.Phil Part-I examination (Mid Term Assessment) will be held in the month of March next year (approximately 15 months after admission) after the completion of one year course work and passing the assessment tests, send up and MOCK examination conducted by the department.

b. The student will be examined in Specialty Courses subjects.

Theory Examination			
Paper I	Specialty Courses	MCQs	100 Marks
Vivo Voce Practical Exam			
Viva Voce	Specialty Course		50 Marks
Practical/OSPE/Table Viva	Specialty Course		50 Marks
Total			**200 Marks**

M. Phil 2nd YEAR Course Content

TOS Code	Subject	Code	Topic	Credit Hours
DM-03	Biomaterials and Tissue Engineering	3.1 3.2 3.3 3.4 3.5	Metallic Implant Materials Ceramic Implant Materials Composites as Biomaterials Polymeric Implant Materials Tissue Engineering	10
DM-04	Biomaterial Characterization	4.1 4.2	Mechanical Characterization of Biomaterials Chemical and Structural Analysis of Dental Biomaterials • SEM • FTIR • RAMAN Spectroscopy • XRD • Contact Angle Measurement	6.5
DM-05	Biocompatibility of Dental Materials	5.1	Determination of Biocompatibility • Dental Amalgam • Resin-based Composites • Cements and Ceramics • Dental Alloys • Polymethylmethacrylate Resins	3.5

DM-06	Dental Materials Research Project		12

Final Examination (After completion of 2 years)

The student shall submit completion of training certificate, log Book, mandatory workshop attendance and the thesis on research topic approved by supervisor (through the Dean to the Controller of Examination). If the thesis not approved by the supervisor, application for extension may be recommended by supervisor through Registrar to the AS&RB. The final examination of major subject, thesis evaluation and viva voce examination will be conducted by board of 4 examiners in major subjects.

The candidate will be examined in major subject and thesis as per following regulation;

- Supervisor will not be paper setter /Examiner of his/her candidate as per PMDC regulation 2001.

Theory Paper			
Paper I	Specialty Course	MCQs	100 Marks
Paper II	Speciality Course	SAQs	100 Marks
Viva Voce Practical and Thesis Defense			
Viva Voce			60 Marks
Practical and OSCE/OSPE			140 Marks
a. Critical Appraisal (70 Marks) b. OSPE (70 Marks)			
1. Thesis Defense			100 Marks
Total			**500 Marks**

Table of Specification

Part 1 (Mid Term Examination)

TOS ID	Subjects	Code	Topics	MCQ	Weightage
DM - 01	Dental Materials	1.1	Occupational	55	55 %
		1.2	Hazards Gypsum		
		1.3	Products		
		1.4	Dental Polymers		
		1.5	Acrylic Resins		
		1.6	Resin Composites		
		1.7	Impression Materials		
		1.8	Dental Cements		
		1.9	Dental Amalgam		
		1.10	Microstructure & Solidification in Metals & Alloys		
		1.11	Dental Waxes		
		1.12	Casting Procedure		
		1.13	Dental Ceramics		
		1.14	Endodontic		
		1.15	Materials Dental		
		1.16	Implants		
			Adhesion and Bonding in Dentistry		
			Polishing & Finishing Materials		

DM - 02	Advanced Dental Materials	2.1 2.2 2.3 2.4 2.5	Advancements in Glass Ionomer Cements Biofunctionalization of titanium for dental implant Compositional Characteristics and Hydration Mineral Trioxide Aggregate (MTA) Aging and Stability of Bonded Interfaces Fibre Reinforced Composites	45	45 %

		2.6 2.7 2.8 2.9	Nanotechnology in Dental Sciences Recent advancements in the development of GTR/GBR membranes for periodontal regenerations Materials Research Techniques		
Total				100	100%

Table of

Specification Year 2

(Final Examination)

TOS Code	Subject	Code	Topic	Weightage
DM-03	Biomaterials	3.1 3.2 3.3 3.4	Metallic Implant Materials Ceramic Implant Materials Composite as Biomaterials Tissue Engineering	30%

DM-04	Material Characterization	4.1 4.2	Mechanical Characterization of Biomaterials Chemical and Structural Analysis of Dental Biomaterials • SEM • FTIR • RAMAN Spectroscopy • XRD • Contact Angle Measurement	20 %

DM-05	Biocompatibility of Dental Materials	5.1	Determination of Biocompatibility • Dental Amalgam • Resin-based Composites • Cements and Ceramics • Dental Alloys • Polymethylmethacrylate Resins	10%

List of Essential Readings

BOOKS

1. Phillip's Science of Dental Materials. Edited by K.J. Anusavice, Publisher Saunders, 12th edition, 2012.
2. Dental materials and their selection, William J.O' Brien. 3rd edition. Publisher Quintessence, 2002.
3. Craig's Restorative Dental Materials, Ronald Sakaguchi, Jack Ferracane, John Powers, 14th edition, Publisher Mosby, 2018
4. Biomaterials an Introduction, Joon Park & R.S. Lakes, Springer, 3rd Edition, 2007
5. Dental Biomaterials Imaging testing, and modelling, Richard Curtis & Timothy Watson, Woodhead Publishing Limited, 2008
6. Biocompatibility of Dental Materials, Gottfride Schmalz & Dorthe Arenholt, Spriger, 2009
7. Biomaterials Science; An Introduction to Materials in Medicine, Buddy D. Ratner, 3rd Edition, Elsevier Inc

JOURNALS

8. Dental Materials. Editor-in-Chief: David C. Watts PhD, FADM. University of Manchester School of Dentistry, Manchester, UK

9. Dental Materials Journal. Editor-in-Chief Satoshi IMAZATO. An Official Journal of the Japanese Society for Dental Materials and Devices Japan Society for Adhesive Dentistry
10. Australian Dental Journal. Editor-in-Chief Professor Mark Bartold. The Official Journal of Australian Dental Association
11. Journal of College of Physicians and surgeons (JCPSP), Editor-in-Chief Prof. Dr Zafar Ullah Chaudhry, Pakistan