MASTER OF SCIENCE IN DENTAL MATERIALS SCIENCE

INTRODUCTION

The Department of Bio-clinical Sciences (Faculty of Dentistry) offers a Master of Science program in **Dental Materials Science**. Full-time students are admitted to the program. Exceptionally, part-time students can be admitted with the agreement of the program committee. The program, which is thesis based, aims to provide the student with a fundamental knowledge of the principles in justifying selection criteria and manipulation instructions for all classes of materials relevant to the practice of dentistry.

According to the University Council decision dated 4/2/2007, Thesis students admitted with effect from September 2007 are exempted from the comprehensive examination.

PROGRAM REQUIREMENTS

The program requirements are:

35 TOTAL COURSE CREDITS

26 COMPULSORY (credits in parenthesis)

1210-501	Foundations of Dental Materials Science: Mechanical Properties to Polymers	(3)
1210-502	Introduction to Materials Testing (laboratory practical)	(2)
1210-505	Metals Processing: Amalgam to Steel	(2)
1210-506	Introduction to Materials Research in Dentistry (laboratory practical)	(3)
1210-507	Advanced Topics in Dental Materials Science: Ceramics, Physics *et al*	(3)
1210-508	Laboratory Projects (1)	(2)
1210-509	Safety and Clinical Efficacy of Dental Materials	(3)
1210-511	Ramifications: Analysis & Synthesis for Materials Problems in Dentistry	(3)
1210-512	Laboratory Projects (2)	(2)
2000-501	Scientific Writing and Communication Skills	(3)

9 COMPULSORY (Thesis)

1210-597	(0)
1210-598	(0)
2000-599	(9)

COURSE DESCRIPTION

1210-501: FOUNDATIONS OF DENTAL MATERIALS SCIENCE: MECHANICAL PROPERTIES TO POLYMERS
CR: 3

This course lays the groundwork for more advanced study by introducing the language of materials science, the basics of mechanical testing and its implications, the chemistry and physics of polymers, composition and phase diagrams, the behaviour of composite structures with several example systems used in dentistry (gypsum, filled resins, impression materials), and the properties and role of interfaces.

1210-502: INTRODUCTION TO MATERIALS TESTING
CR: 2

A laboratory based course, conducted through live experimentation and seminar discussion of experimental design and data interpretation. A selection of basic techniques of specimen preparation and testing in a variety of contexts will be covered using materials and experimental designs selected by the student to suit particular interests within the scope and aims of the curriculum as a whole.

1210-505: METALS PROCESSING: AMALGAM TO STEEL
CR: 2 PR: 1210-501

Metallic materials are used in dentistry largely for reasons of strength, and this course covers the properties, structure and behaviour of metals in general, including such topics as constitution, effects of processing, and corrosion. Dental casting alloys, steels and 'hard metals' are explained as regards key aspects for their applications, as well as dental silver amalgam in detail, including mixing behaviour (with its broad ramifications for other systems). Associated materials and processes for preparing dental metallic materials: mould-making, casting, finishing, and soldering and welding are also covered.

1210-506: INTRODUCTION TO MATERIALS RESEARCH IN DENTISTRY
CR: 3 PR: 1210-501, 502

As in 1210-502, but with more elaborate schemes from deeper questions will be developed and practiced, again in a variety of contexts and using materials and experimental designs selected by the student to suit particular interests within the scope and aims of the curriculum as a whole.

1210-507: ADVANCED TOPICS IN DENTAL MATERIALS SCIENCE: CERAMICS, PHYSICS ET AL.
CR: 3 PR: 1210-505

Materials used in dentistry are becoming more complex in design. This course covers ceramic materials, which being intended to be tooth-mimics depend on optical properties. The meaning of colour, the physics of light, and the implications for dentistry are explored. Materials are used to make devices, and their behaviour as such is understood in terms of mechanics, and not just mechanical properties. In addition, the radiographic properties of materials are important in the clinic; key aspects of imaging systems are included.

1210-508: LABORATORY PROJECTS (1)
CR: 2 PR: 1210-505, 506

From study of the current literature, or prompted by clinical questions, novel projects will be designed by the student, discussed with the instructors, and implemented with a view to producing publication-quality reports. If possible, such work will be published, although the emphasis remains on training in the integration of didactic learning, laboratory technique and data interpretation.

1210-509: SAFETY AND CLINICAL EFFICACY OF DENTAL MATERIALS
CR: 3 PR: 1210-501, 502, 503

Before a product can be used in or on a patient (or in a laboratory), there is a long and complex cycle of development and testing in order that it address the basic service requirements. It must then undergo clinical trials, which require ethical approval, before it can be certified through the processes of CE and FDA (for example) approval. They have as their focus the safety of the product. Other jurisdictions and bodies have similar processes. In addition, there are national and international standards for efficacy. Even so, there are recognized hazards with many of the reactive substances in modern materials against which precautions must be taken. The selection of materials is thus based on many factors, but ultimately it must be evidence-based, and thus often comes from clinical service reports. The appraisal of such journal publications for this purpose is therefore also important.

1210-511: RAMIFICATIONS: ANALYSIS & SYNTHESIS FOR MATERIALS PROBLEMS IN DENTISTRY
CR: 3 PR: 1210-507

The preceding courses are designed to provide the student with a fundamental knowledge of the principles underlying the mechanical, physical and chemical properties; the structure at molecular, microscopic and macroscopic levels; and the behaviour in all relevant aspects of each class of material used in dentistry in relation to their function, application handling and service. To bring this all into play, selected recent papers addressing or relying on aspects of materials science will be studied in detail to illuminate and expand on the foundational subject matter, identify other topics for study, and critical review the design and interpretation of experimental work.

1210-512: LABORATORY PROJECTS (2)
CR: 2 PR: 1210-507, 508

As for course 1210-508, with a greater emphasis on depth and detail.

1210-597: THESIS
CR: 0

1210-598: THESIS
CR: 0

2000-599: THESIS
CR: 9

The thesis is compulsory. It contains a literature review, methods, empirical study results, discussion and references according to the international standards, e.g. US, UK, Scandinavia. Assessment of thesis is requested by an external examiner.