Dental Biomaterials, MS

Dean: Elsbeth Kalenderian, DDS, MPH, Ph.D.
School of Dentistry website (http://www.marquette.edu/dentistry/)

Degrees Offered

Master of Science degrees in five disciplines

Graduate Program Overview

The School of Dentistry offers graduate programs in dental biomaterials, endodontics, orthodontics, periodontics and prosthodontics. These programs can be modified to allow conjoint interdisciplinary graduate work to be undertaken in any other unit of the university, and a master of science or doctoral degree can be obtained through an appropriate graduate degree-granting department of the university or through the interdisciplinary Ph.D. program. Faculty for each dental graduate program are drawn both from full-time Dental School faculty and from practicing specialists in the field who serve as adjunct faculty (part-time faculty).

The full-time dental biomaterials program is a non-accredited 2-year program leading to a master's degree.

The master of science programs in endodontics, orthodontics, periodontics and prosthodontics are clinically and research based, offering specialty certification with the master's degree. Graduates are prepared to handle complex clinical cases and to work effectively with both general dentists and other dental specialists. Full-time programs in endodontics is 24-months, orthodontics is 26.5-months, and periodontics and prosthodontics are 36 months each. Tuition for the specialty programs is charged at a flat rate as per the Tuition, Fees and Housing section of this bulletin. Any applicable instrument or service fees are charged during the fall term each year.

Course work requirements for each graduate program are determined by the director of the specific program in accordance with accreditation standards. Courses include study in basic health sciences, dental biomaterials, research methodology, clinical dental specialties and other related science disciplines, as appropriate.

Non-Degree Students in Dentistry Courses

Normally, students with non-degree status are not permitted to enroll in dentistry courses. Graduate students from approved dental residency programs may enroll in any dental graduate courses but need prior approval from the School of Dentistry's associate dean for research and graduate studies.

Graduate students in dental biomaterials pursue the application of scientific principles to the study of dental biomaterials including relationships among compositions, physical properties and clinical properties for dental biomaterial systems.

A student in the dental biomaterials program must complete a minimum of 30 credit hours of course work, consisting of a curriculum of graduate dental biomaterials courses (23 credits), statistics (1-3 credits) and thesis work (6 credits). The dental biomaterials graduate program is an interdisciplinary program covering principles of materials science, engineering, chemistry, physics, biology and dentistry. Satisfactory completion of the didactic and research components of the program results in a master's degree through the Marquette University Graduate School. In addition to the courses offered by the School of Dentistry (described in detail under the Dental Biomaterials course description section of this bulletin), master's candidates may be required by their program adviser to select courses offered through other departments.

A student may choose to take an additional, optional elective for 1 additional credit hour that is not required for the degree. Typically, the topic of this course is tissue engineering within the School of Dentistry's dental graduate core curriculum. Elective courses in other appropriate areas in the dental graduate core curriculum or materials science (from the College of Engineering) may also be selected according to the backgrounds and interests of the individual students.

Master of science degree applicants may only be admitted to the program under Plan A, which has two options: the traditional thesis option and the publication option. In partial fulfillment of the requirements to obtain the master of science degree, all candidates must conduct a research project on an appropriate clinical or basic science topic, and successfully defend their research project. Format and content of the public defense is determined by the advisory committee.

Candidates are encouraged to pursue research that originates in their chosen dental specialty. Research projects are selected in consultation with the graduate program director. Where possible, graduate students are encouraged to do clinically relevant research.

Graduate students who choose the thesis option have their research and thesis preparation supervised by a primary adviser and approved by a thesis advisory committee that consists of at least three members. The publication option, in addition, culminates in the acceptance of a first author, original, peer-reviewed publication based on a research project. Selection of the publication option requires completion of a traditional thesis in the event the submitted manuscript is not accepted by the submission deadline listed in this bulletin. All graduate students are required to present their research formally.

Code	Title	Hours
Graduate Dental Biomaterials courses (23 credits):		
BIMA 6101	Mechanical Behavior of Dental Biomaterials	3
BIMA 6102	Polymeric Dental Biomaterials	2
BIMA 6151	Dental Cements	2
BIMA 6201	Dental Metallurgy 1	3
BIMA 6202	Dental Metallurgy 2	3
BIMA 6251	Dental Ceramics	3
BIMA 6570	Biomaterials Science and Engineering	3
BIMA 6601	Dental Biomaterials Literature Review 1	1
BIMA 6602	Dental Biomaterials Literature Review 2	1
BIMA 6603	Dental Biomaterials Literature Review 3	1
BIMA 6604	Dental Biomaterials Literature Review 4	1
BIMA 6999	Master's Thesis	6
Statistics course (1-3 credits):		1-3
DENT 6003	Dental Graduate Didactic Core Curriculum 3 (Biostatistics, taken for 1 cr.)	
or MSSC 5720	Statistical Methods	
Total Credit Hours:		**30-32**

University Policies

- Academic Censure - Graduate School (https://bulletin.marquette.edu/policies/academic-censure/graduate/)
- Academic Integrity (https://bulletin.marquette.edu/policies/academic-integrity/)
- Academic Misconduct (https://bulletin.marquette.edu/policies/academic-misconduct-policy/)
- Academic Program Definitions (https://bulletin.marquette.edu/policies/academic-programs-defined/)
- Accelerated Degree Programs (https://bulletin.marquette.edu/policies/accelerated-degree-programs/)
- Attendance - Graduate School (https://bulletin.marquette.edu/policies/attendance/graduate/)
- Awarding Diplomas and Certificates (https://bulletin.marquette.edu/policies/awarding-diplomas-certificates/)
- Background Checks, Drug Testing (https://bulletin.marquette.edu/policies/background-checks-drug-testing/)
- Class Rank (https://bulletin.marquette.edu/policies/class-rank/)
- Commencement (https://bulletin.marquette.edu/policies/commencement/)
- Course Levels (https://bulletin.marquette.edu/policies/course-levels/)
- Credit Hour (https://bulletin.marquette.edu/policies/credit/)
- Credit Load - Graduate School (https://bulletin.marquette.edu/policies/credit-load/graduate/)
- Faculty Grading (https://bulletin.marquette.edu/policies/faculty-grading/)
- Family Education Rights and Privacy Act-FERPA (https://bulletin.marquette.edu/policies/ferpa/)
- Grade Appeals (https://bulletin.marquette.edu/policies/grade-appeals/)
- Grading System - Graduate School and Graduate School of Management (https://bulletin.marquette.edu/policies/grading-system/graduate-management/)
- Graduation - Graduate School (https://bulletin.marquette.edu/policies/graduation/graduate/)
- Immunization and Tuberculosis Screening Requirements (https://bulletin.marquette.edu/policies/immunization-and-tuberculosis-screening/)
- Last Date of Attendance/Activity (https://bulletin.marquette.edu/policies/last-dateof-attendance-activity/)
- Military Call to Active Duty or Training (https://bulletin.marquette.edu/policies/militarycall-active-duty-training/)
- Registration - Graduate School (https://bulletin.marquette.edu/policies/registration/graduate/)
- Repeated Courses - Graduate School (https://bulletin.marquette.edu/policies/repeated-courses/graduate/)
- Student Consumer Complaints (https://bulletin.marquette.edu/policies/student-complaints/)
- Student Data Use and Privacy (https://bulletin.marquette.edu/policies/student-data-use-privacy/)
- Transcripts-Official (https://bulletin.marquette.edu/policies/transcripts-official/)
- Transfer Course Credit - Graduate School (https://bulletin.marquette.edu/policies/transfer-course-credit-policy/graduate/)
- Withdrawal - Graduate School (https://bulletin.marquette.edu/policies/withdrawals/graduate/)

Graduate School Policies

- Academic Performance (https://bulletin.marquette.edu/graduate/policies/academic-performance/)
- Advising (https://bulletin.marquette.edu/graduate/policies/advising/)
- Certificate Concurrent Enrollment (https://bulletin.marquette.edu/graduate/policies/certificate-concurrent-enrollment/)
- Conduct (https://bulletin.marquette.edu/graduate/policies/conduct/)
- Confidentiality of Proprietary Information (https://bulletin.marquette.edu/graduate/policies/confidentiality-proprietary-information/)
- Continuous Enrollment (https://bulletin.marquette.edu/graduate/policies/continuous-enrollment/)
- Courses and Prerequisites (https://bulletin.marquette.edu/graduate/policies/courses-prerequisites/)
- Cross-listed Courses (https://bulletin.marquette.edu/graduate/policies/cross-listed-courses/)
- Deadlines (https://bulletin.marquette.edu/graduate/policies/deadlines/)
- Doctoral Degree Academic Program Overview (https://bulletin.marquette.edu/graduate/policies/doctoral-program-overview/)
- Dual/Joint Programs of Study (https://bulletin.marquette.edu/graduate/policies/dual-joint-programs/)
- Graduate Credit (https://bulletin.marquette.edu/graduate/policies/graduate-credit/)
- Graduate School Policies (https://bulletin.marquette.edu/graduate/policies/)
- Independent Study (https://bulletin.marquette.edu/graduate/policies/independent-study/)
- Intellectual Property (https://bulletin.marquette.edu/graduate/policies/intellectual-property/)
- Master's Degree Academic Program Overview (https://bulletin.marquette.edu/graduate/policies/masters-program-overview/)
- Merit-Based Aid Registration Requirements (https://bulletin.marquette.edu/graduate/policies/merit-based-aid-registration-requirements/)
- Research Involving Humans, Animals, Radioisotopes or Recombinant DNA/Transgenic Organisms (https://bulletin.marquette.edu/graduate/policies/research-involving-humans-animals-radioisotopes-recombinant-dnatransgenic-organisms/)
- Temporary Withdrawal from Graduate Program (https://bulletin.marquette.edu/graduate/policies/temporary-withdrawal-graduate-program/)
- Time Limitations (https://bulletin.marquette.edu/graduate/policies/time-limitations/)
- Working with Minors (https://bulletin.marquette.edu/graduate/policies/working-minors/)

Graduate Dental Programs

- Dental Biomaterials, MS (p. 1)
- Endodontics, MS (https://bulletin.marquette.edu/graduate/endodontics-ms/)
- Orthodontics, MS (https://bulletin.marquette.edu/graduate/orthodontics-ms/)
- Periodontics, MS (https://bulletin.marquette.edu/graduate/periodontics-ms/)
- Prosthodontics, MS (https://bulletin.marquette.edu/graduate/prosthodontics-ms/)

BIMA 6101 Mechanical Behavior of Dental Biomaterials (3 credits)
Basic principles of mechanics, elastic deformation, plastic deformation and fracture. Comparison of mechanical behavior of metallic, ceramic and polymer dental biomaterial systems. Discussion of tension, compression, shear, bending, torsion, hardness and impact tests for dental biomaterials. Includes laboratory exercises.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206101)

BIMA 6102 Polymeric Dental Biomaterials (2 credits)
Compositions and properties of polymers utilized in prosthetic, restorative, orthodontic, preventive, and implant dentistry. The materials include poly (methyl methacrylate), BIS-GMA, polyurethane and polyvinyl products in the form of resins, composites and microfills polymerized by heat, chemicals and ultraviolet or visible lights. Includes laboratory exercises.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206102)

BIMA 6151 Dental Cements (2 credits)
Compositions, setting reactions and properties of zinc phosphate, zinc oxide-eugenol, polycarboxylate, glass ionomer and resin dental cements. Effects of clinical variables and the ADA specifications related to these materials will be included. May include laboratory exercises.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206151)

BIMA 6152 Dental Impression Materials (2 credits)
Classification, composition and properties of the various impression materials used in restorative and prosthetic dentistry. The material systems to be discussed include impression compound, hydrocolloids, polysulfides, polyethers and silicones. May include laboratory exercises.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206152)

BIMA 6153 Dental Casting Procedures (3 credits)
History and development of dental casting procedures. Basic principles and techniques for centrifugal, vacuum and pressure casting. Solidification of metals and classification of porosities. Detailed considerations for casting of noble and base metal dental alloys. Includes laboratory exercises.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206153)

BIMA 6201 Dental Metallurgy 1 (3 credits)
Theory and application of metallurgical principles to the study of dental alloy systems. Dental amalgams, noble and base metal casting alloys, and wrought alloys. Area and extent of study determined by individual needs of student. Includes laboratory exercises.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206201)

BIMA 6202 Dental Metallurgy 2 (3 credits)
See BIMA 6201.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206202)

BIMA 6251 Dental Ceramics (3 credits)
Basic principles of ceramic structures and properties. History, properties and technology of dental porcelains, gypsum products and dental casting investments. Includes laboratory exercises.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206251)

BIMA 6501 Advanced Experimental Techniques for Dental Biomaterials Research 1 (1 credits)
Biomaterials Research 1 laboratory courses. Topics may vary, but will generally include scanning electron microscopy, mechanical testing procedures, and X-ray diffraction.
Prerequisite: Admission to graduate program in dental biomaterials.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206501)

BIMA 6502 Advanced Experimental Techniques for Dental Biomaterials Research 2 (1 credits)
Biomaterials Research 2 laboratory courses. Topics may vary, but will generally include scanning electron microscopy, mechanical testing procedures, and X-ray diffraction.
Prerequisite: Admission to graduate program in dental biomaterials.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206502)

BIMA 6570 Biomaterials Science and Engineering (3 credits)
Basic and advanced principles of dental biomaterials science. Fundamental scientific principles, and physical, mechanical, chemical and biological properties of restorative and preventive dental biomaterials. Relationships between properties and clinical performance of these materials and methods used for testing them.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206570)

BIMA 6601 Dental Biomaterials Literature Review 1 (1-3 credits)
Discussion of current and classic literature in dental biomaterials. Topics and journals discussed are rotated to provide an overview and range of different materials, properties, and applications. Emphasizes class discussion and presentations.
Prerequisite: Grad. stndg. in BIMA graduate program or cons. of dept.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206601)

BIMA 6602 Dental Biomaterials Literature Review 2 (1-3 credits)
See BIMA 6601.
Prerequisite: Grad. stndg. in BIMA graduate program or cons. of dept.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206602)

BIMA 6603 Dental Biomaterials Literature Review 3 (1-3 credits)
See BIMA 6601.
Prerequisite: Grad. stndg. in BIMA graduate program or cons. of dept.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206603)

BIMA 6604 Dental Biomaterials Literature Review 4 (1-3 credits)
See BIMA 6601.
Prerequisite: Grad. stndg. in BIMA graduate program or cons. of dept.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206604)

BIMA 6931 Topics in Dental Biomaterials (1-3 credits)
Practical laboratory exercises designed to provide the student with specific skill sets and analytic approaches used in modern materials research.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206931)

BIMA 6970 Biomaterials Seminar (1 credits)
Current topics and concepts in materials science.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206970)

BIMA 6980 Teaching Experience in Dental Biomaterials (1-2 credits)
Teaching and preclinical laboratory assignments in dental biomaterials for undergraduate dental students.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206980)

BIMA 6995 Independent Study in Dental Biomaterials (1-3 credits)
Faculty-supervised, independent study/research of a specific area or topic in Dental Biomaterials.
Prerequisite: Cons. of instr. Consent required.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206995)

BIMA 6999 Master's Thesis (1-6 credits)
Credit hours assigned to thesis preparation and scholarship. S/U grade assessment.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%206999)

BIMA 9970 Graduate Standing Continuation: Less than Half-Time (0 credits)
Fee. S/U grade assessment. Designated as less than half-time status only, cannot be used in conjunction with other courses, and does not qualify students for financial aid or loan deferment.
Prerequisite: Consent required.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%209970)

BIMA 9994 Master's Thesis Continuation: Less than Half-Time (0 credits)
Fee. S/U grade assessment. Allows a student to be considered the equivalent of less than half-time status. Requires that the student is working less than 12 hours per week on their master's thesis. All six thesis credits required for the degree should be completed before registering for non-credit Master's Thesis Continuation.
Prerequisite: Consent required.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%209994)

BIMA 9995 Master's Thesis Continuation: Half-Time (0 credits)
Fee. S/U grade assessment. Allows a student to be considered the equivalent of half-time status. Requires that the student is working more than 12 to less than 20 hours per week on their master's thesis. All six thesis credits required for the degree should be completed before registering for non-credit Master's Thesis Continuation.
Prerequisite: Consent required.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%209995)

BIMA 9996 Master's Thesis Continuation: Full-Time (0 credits)
Fee. S/U grade assessment. Allows a student to be considered the equivalent of full-time status. Requires that the student is working 20 hours or more per week on their master's thesis. All six thesis credits required for the degree should be completed before registering for non-credit Master's Thesis Continuation.
Prerequisite: Consent required.
Level of Study: Graduate
Schedule of Classes (https://bulletin.marquette.edu/class-search/?details&code=BIMA%209996)