

Medical Informatics

College of Engineering and Applied Science (CEAS)

Degree Conferred: PhD in Medical Informatics

Phone: (414) 229 4677; (414) 229 5183

FAX: (414) 229 6958

E-mail: medinfphd@uwm.edu

Website: <http://www.medinf.uwm.edu>

Other participating units:

College of Health Sciences (COHS)

College of Nursing (NUR)

School of Business Administration (SBA)

School of Information Studies (SOIS)

The Medical College of Wisconsin (MCW)

Contents:

- Doctor of Philosophy in Medical Informatics
- Courses
- Graduate Faculty

Description

The PhD in Medical Informatics is an interdisciplinary doctoral program offered by UWM through collaboration between several academic units at UWM and the Medical College of Wisconsin. The Program is housed in the Department of Electrical Engineering and Computer Science, CEAS. It is guided by a Steering Committee consisting of faculty from the academic units participating in the Program.

Medical Informatics is a field that is concerned with the cognitive, information processing, and communication aspects of medicine and healthcare including the information sciences and technology to support these tasks. The field covers the application of information technology in clinical medicine, medical record keeping, medical instrumentation, and healthcare management.

The main goal of the PhD program is to prepare graduates to perform advanced research in the discipline and to assume leadership roles in medical and healthcare industries. The degree is philosophically conceptualized as involving several disciplines in a collaborative learning process with the goal of fostering inter-professional interactions and inquiry. This degree will build upon existing graduate programs and research in the participating units. Qualified students with strong academic records in any of these programs will be considered for admission.

Admission

An applicant must meet the UWM Graduate School requirements as well as the following to be considered for admission to the program:

- Master's degree in Medical Informatics or a related area such as Computer Science, Electrical Engineering, Health Sciences, Business Administration, Nursing, or an MD degree. Exceptionally strong candidates with Bachelor's degree in a related area will also be considered for admission.
- Statement of professional and/or scholarly accomplishments and a letter of intent specifying areas of interest and career goals.
- At least two letters of recommendation that attest to academic and/or professional qualifications.
- Scores from GRE (general) or GMAT or MCAT; (Test should have been taken within the last five years.)

For international applicants from countries whose first language is not English, a score of at least 250 on the computer-based (or 600 on the paper-based) Test of English as a Foreign Language (TOEFL) is required. A score of 6.5 on the international English Language Testing Systems (IELTS) examination will be required in lieu of the TOEFL.

The application for admission should be filed directly with the Graduate School, along with the statement of professional interest. Letters of recommendation, standardized test cores should be sent to:

Co Director
 Medical Informatics Program
 College of Engineering and Applied Science
 University of Wisconsin-Milwaukee
 Milwaukee, WI 53201

Requests for financial support must also be submitted to the above person.

Areas of Concentration

The PhD program requires a student to follow one of the following four areas of concentration. (At the time of application, each applicant should indicate a preferred area of concentration in their statement of Reasons for Graduate Study.)

Knowledge Based Systems Track

The Knowledge Based Systems track is designed to train students in the development of techniques to support decision-making in medical practice (including both clinical and administrative decision-making) and customized instruction on health and medical topics for patients and health care providers. Technical areas include decision analysis, expected utility theory and cost-effectiveness analysis, computer-based decision support systems, user modeling and user interface design, intelligent tutoring systems, knowledge representation, structured reporting, and data mining and knowledge discovery.

Health Services Management & Policy Track

Health services management and policy research is broad in scope and touches on all of the standard functional business areas (e.g., management, strategy and marketing, finance/economics, management information systems, human resources management) in addition to government health policy/reimbursement/regulation, insurance and other payer mechanisms, dealing with health professionals, and illness/health in individuals and in populations. The track is designed to equip students to deal with both management information and with population health and illness information and research to understand the implications of such information and research, and to transform inferences from that information and research into practical recommendations on the national, state, and local level. By its nature, it is applied to health services settings including hospitals, skilled-nursing facilities, medical group practices, public health agencies, mental health services, managed care organizations, and integrated health networks.

Health Information Systems Track

The track in Health Information Systems is designed to explore the role of administrative and clinical information systems in health care organizations. Attention will be directed at the design, implementation, and maintenance of the broad array of computer applications used in the health care industry. An interdisciplinary approach will be taken drawing on expertise from the health professions, management information systems, and library and information science. Curricular content will range from systems analysis and design, system efficacy and management, to e-commerce.

Medical Imaging and Instrumentation Track

The track in Medical Imaging and Instrumentation is designed to train students in understanding and developing medical imaging systems and medical electronic instrumentation. The aspects emphasized in this track are medical imaging systems, image processing, computer vision, pattern recognition, medical instrumentation development and optimization, computer modeling, applications of electric and magnetic fields, and wireless communication.

Curricular Structure and Degree Requirements

Students enrolled in this program must follow all UWM Graduate School requirements and regulations. The minimum requirement for the PhD in Medical Informatics will be 61-67 credits beyond the Bachelor's degree. Up to 24 credits from a related master's degree may be applied toward the PhD.

The curriculum will consist of a common set of core courses for all tracks, required and elective courses for each individual track, and the dissertation. The purpose of the core is to ensure that all graduates of the program share a basic common knowledge in Medical Informatics. The purpose of the tracks is to enable the students to develop significant strengths in specific sub-areas within Medical Informatics. The courses identified in the curriculum are offered by UWM or MCW and, in some case, by both institutions. Following are descriptions of these components and their corresponding credit requirements.

Core Courses (16 to 20 credits)

The core courses provide a comprehensive structure for the foundations needed for all students in Medical Informatics irrespective of their special interests. This includes a series of seminars that deal with different aspects of Medical Informatics. All students must take the following core courses or must have taken equivalent courses in previous study.

Courses	Credits
Medical Informatics, MCW 13200(A,B), (6 quarter credits) or Health Care Informatics, UWM HCA700	4 credits 2 credits
Human Pathophysiology, UWM CLSCI701 and CLSCI702	6 credits
Medical Informatics Seminar, MCW/UWM COMPSCI870 (New course to be developed that consists of four 1-credit seminars)	4 credits
Data Bases, UWM COMPSCI557 or BUS ADM749	3 credits
Medical Ethics, MCW 12202 or UWM BUS ADM795 or HCAXXX (being developed)	1 credit 3 credits
• Knowledge Based Systems Track: (33 credits of course work & 12 credits of dissertation)	
Required Track Courses/12 credits	Credits
COMPSCI535: Data Structures	3 credits
COMPSCI710: Artificial Intelligence	3 credits
COMPSCIXXX: Data Mining in Medicine	3 credits
COMPSCI743: Intelligent User Interfaces (NEW-taught as 790 topic since 1999)	3 credits
Required Mathematics & Quantitative Methods/6 credits	
<i>Statistics (3 credits from the following list)</i>	
BUS ADM795: Multivariate Techniques in Management Research	3 credits
BUS ADM912: Statistical Methods for Management Research	3 credits
ED PSY624: Educational Statistical Methods I	3 credits
MATH767: Statistical Methods for Engineers and Scientists	3 credits
MTHSTAT761: Mathematical Statistics I	3 credits
<i>Probability (3 credits from the following list)</i>	
ECON413: Statistics for Economists	3 credits
MATH771: Theory of Probability	3 credits
Elective Track Courses/15 credits	
Dissertation/12 Credits	
COMPSCI998: Doctoral Thesis	(variable credits)
• Health Services Management & Policy Track: (33 credits of course work and 12 credits of dissertation)	
Required Track Courses/18 credits	Credits
BUS ADM755: Health Care Administration	3 credits
BUS ADM757: Managed Care and Integrated Health Networks	3 credits
ECONXXX: Health Care Economics	3 credits
BUS ADM744: Management of Information Systems	3 credits
BUS ADM996: Essential Topics in Strategic Management	3 credits
BUS ADM996: Advanced Topics in Strategic Management	3 credits
Required Mathematics and/or Quantitative Methods/6 credits	
[BUS ADM918: Doctoral Seminar in Behavioral Research Techniques	3 credits
[BUS ADM795: Multivariate Techniques in Management Research	3 credits
OR	
[ECON513: Econometrics	3 credits
[ECON710: Applied Econometrics	3 credits

Elective Track Courses/9 credits from the following list

Dissertation/12 credits

BUS ADM997: Doctoral Dissertation (variable credits)

- **Health Information Systems Track:** (35 credits of course work and 12 credits of dissertation)

Required Track Courses/20 credits **Credits**

BUS ADM744: Management of Information Systems 3 credits

BUS ADM747: Systems Analysis and Design 3 credits

COMPSCIXXX/MCW XXX: Introduction to Medical Decision Making 3 credits

HCA721: Health Information Technology Procurement 2 credits

HCA723: Health Care Systems Applications - Administrative and Clinical 3 credits

HCAXXX: Advanced Concepts in Health Care Systems 3 credits

COMPSCI759: Data Security 3 credits

or

BUS ADM893: Infrastructure for Electronic Business 3 credits

Research Methods/3 credits from the following list

IND ENG716: Engineering Statistical Analysis 3 credits

BUS ADM714: Multivariate Techniques in Management Research 3 credits

BUS ADM795: Multivariate Techniques in Management Research 3 credits

BUS ADM912: Statistical Methods for Management Research 3 credits

BUS ADM918: Doctoral Seminar in Behavioral Research Techniques 3 credits

BUS ADM995: Doctoral Seminar in Decision Sciences 3 credits

NURS882: Qualitative Approaches to Nursing Research 3 credits

NURS883: Quantitative Approaches to Nursing Research 3 credits

Elective Track Courses/12 credits

Dissertation/12 credits

COMPSCI998: Doctoral Thesis (variable credits)

- **Medical Imaging & Instrumentation Track:** (33 credits of course work & 12 credits of dissertation)

Required Track Courses/18 credits **Credits**

ELECENG436: Introduction to Medical Imaging & Instrumentation 3 credits

ELECENG711/COMPSCI711: Pattern Recognition Statistical, Neural and Fuzzy Approaches 3 credits

ELECENG712/COMPSCI712: Image Processing 3 credits

ELECENGXXX: Advanced Medical Instrumentation 3 credits

ELECENGXXX: Medical Imaging 3 credits

ELECENG890/COMPSCI790: Special Topics in Medical Signal Processing and Imaging 3 credits

Elective Track Courses/15 credits

Dissertation/12 credits

ELECENG998: Doctoral Thesis (variable credits)

Additional Requirements:

Qualifying Examination

A qualifying examination must be taken to determine whether the student is qualified for doctoral level work in Medical Informatics. This examination is administered by the steering committee and must be taken prior to the completion of 21 credits of course work in the program.

Doctoral Preliminary Examination

The student is also required to take a preliminary examination prior to the advancement of candidacy to determine the student's preparation for independent research. Prior to the examination, the student must present a proposal for a doctoral dissertation. The preliminary examination may cover both graduate course material and the dissertation proposal. The preliminary examination must be successfully completed within five years of initial enrollment.

Dissertation

The candidate must complete a dissertation presenting independent original research that adds to the existing body of knowledge in Medical Informatics. It should be of such caliber that warrants publication in respected journals.

Dissertation Defense

The final oral examination will be an oral defense of the Dissertation but may also cover the general field of the primary area of study. The examination may not be taken until all other degree requirements are satisfied. A majority of the examination committee members must approve the dissertation in order for the student to pass. The final oral examination must be taken within five years after passing the preliminary examination. Candidates who exceed this time limit may be required to retake the preliminary examination and be admitted to candidacy a second time.

Time Limit

All components of the PhD program must be completed within 10 years of matriculation.

Courses

For a catalog statement of each of the courses listed above, please visit the websites of the appropriate program area (see below):

COMPSCI http://www.uwm.edu/Dept/Grad_Sch/Publications/Bulletin/engineering.html#ugcs

CLSCI http://www.uwm.edu/Dept/Grad_Sch/Publications/Bulletin/clinical_laboratory_sciences.html#ug

HCA http://www.uwm.edu/Dept/Grad_Sch/Publications/Bulletin/health_care_administration.html

BUS ADM http://www.uwm.edu/Dept/Grad_Sch/Publications/Bulletin/business_administration.html#ug

ED PSY http://www.uwm.edu/Dept/Grad_Sch/Publications/Bulletin/educational_psychology.html#ugc

MATH http://www.uwm.edu/Dept/Grad_Sch/Publications/Bulletin/mathematics.html#ug

MTHSTAT http://www.uwm.edu/Dept/Grad_Sch/Publications/Bulletin/mathematics.html#ugms

ECON http://www.uwm.edu/Dept/Grad_Sch/Publications/Bulletin/economics.html#ug

NURS http://www.uwm.edu/Dept/Grad_Sch/Publications/Bulletin/nursing.html#ug

L&I SCI http://www.uwm.edu/Dept/Grad_Sch/Publications/Bulletin/library_information_science.html#ug

OCCTHPY http://www.uwm.edu/Dept/Grad_Sch/Publications/Bulletin/occupational_therapy.html#ug

IND ENG http://www.uwm.edu/Dept/Grad_Sch/Publications/Bulletin/engineering.html#ugime

ELECENG http://www.uwm.edu/Dept/Grad_Sch/Publications/Bulletin/engineering.html#ugee

Graduate Faculty