

# ***Graduate Program in Health Informatics***

## ***Student Handbook***

***Master of Health Informatics (M.H.I.)  
Master of Science, Plan A and Plan B (M.S.)  
Doctor of Philosophy (Ph.D.)***

**Institute for Health Informatics  
Academic Health Center  
University of Minnesota  
420 Delaware St. S.E.  
MMC 912  
Minneapolis, MN 55455**

**Director of Graduate Studies  
Terrence J. Adam, M.D., Ph.D.  
(612) 625-5825  
[adamx004@umn.edu](mailto:adamx004@umn.edu)**

**Associate Director of Graduate Studies  
Layne M. Johnson, Ph.D.  
(612) 625-8673  
[layne@umn.edu](mailto:layne@umn.edu)**

**Program Administrative Assistant  
Jessica Whitcomb-Trance  
(612) 626-6079  
[jwhitcom@umn.edu](mailto:jwhitcom@umn.edu)**

**Fall 2010**

## Table of Contents

<b>GENERAL INFORMATION.....</b>	<b>4</b>
<i>Program.....</i>	<i>4</i>
<i>Organization.....</i>	<i>5</i>
<i>Degrees Offered.....</i>	<i>5</i>
<i>Curriculum Offerings.....</i>	<i>6</i>
<i>Seminars.....</i>	<i>6</i>
<i>Director of Graduate Studies.....</i>	<i>6</i>
<i>Health Informatics Administrative Committees.....</i>	<i>7</i>
<i>Academic Progress Reports.....</i>	<i>7</i>
<i>Satisfactory Academic Progress.....</i>	<i>7</i>
<i>Ethical and Professional Responsibilities.....</i>	<i>7</i>
<i>Student Rights of Appeal.....</i>	<i>9</i>
<i>Orientation.....</i>	<i>9</i>
<b>PROCEDURES.....</b>	<b>10</b>
<i>Registration.....</i>	<i>10</i>
<i>Advising.....</i>	<i>10</i>
<i>Transfers and Waivers.....</i>	<i>10</i>
<b>MASTER OF HEALTH INFORMATICS.....</b>	<b>11</b>
<i>Required Courses.....</i>	<i>11</i>
<i>Sample Programs of Study.....</i>	<i>12</i>
<i>Graduation Requirements.....</i>	<i>13</i>
<i>Administrative Procedures.....</i>	<i>14</i>
<b>MASTERS DEGREE PLAN A (RESEARCH-ORIENTED).....</b>	<b>15</b>
<i>Required Courses.....</i>	<i>15</i>
<i>Plan of Study and Examining Committee.....</i>	<i>16</i>
<i>Research Project.....</i>	<i>16</i>
<i>Examination.....</i>	<i>16</i>
<i>Graduation Requirements.....</i>	<i>16</i>
<i>Administrative Procedures.....</i>	<i>17</i>
<b>MASTERS DEGREE PLAN B (COURSE-ORIENTED).....</b>	<b>18</b>
<i>Required Courses.....</i>	<i>18</i>
<i>Plan of Study and Examining Committee.....</i>	<i>19</i>
<i>Research Project.....</i>	<i>19</i>
<i>Examination.....</i>	<i>19</i>
<i>Graduation Requirements.....</i>	<i>19</i>
<i>Administrative Procedures.....</i>	<i>20</i>

**DOCTOR OF PHILOSOPHY.....21**

*Program Requirements.....21*

*Required Courses.....21*

*Plan of Study and Examining Committee .....22*

*Preliminary Written Examination (PWE).....22*

*Preliminary Oral Examination (POE).....25*

*Research Project.....26*

*Final Oral Examination.....26*

*Administrative Procedures.....27*

**APPENDIX A - MHI Project Cover Page.....29**

## GENERAL INFORMATION

This handbook includes important information about the graduate program in Health Informatics. General Graduate School requirements are also provided. The information found in this guide is specific to the Health Informatics program and is intended as a resource for new and existing students in our graduate program. Details about the Graduate School's rules and procedures can be found in the [Graduate School Handbook](#) and on the Graduate School website – [www.grad.umn.edu](http://www.grad.umn.edu). Further questions about the Health Informatics program may be directed to your advisor, the Director of Graduate Studies (DGS), the Associate Director of Graduate Studies (ADGS), the program administrative assistant, other faculty members, or the Graduate School administrative staff at 316 Johnston Hall. You may also refer to the program home page at <http://www.ih.umn.edu/>.

### **Program**

Health informatics is an interdisciplinary field that applies computer, information, and cognitive sciences to promote the effective and efficient use and analysis of information for the improvement of human health. Because the interaction between an individual health care professional and a patient is at the heart of any healthcare delivery system, it is essential to document the multiple decisions and actions that affect a patient's well being. These clinical records can then be converted into computer-based information systems to promote effectiveness and efficiency within the health care industry.

There is a critical need to develop information systems that lead to more effective decisions and greater efficiency within health care. Meeting this need requires an interdisciplinary collaboration of scholars with knowledgeable practitioners from areas including medicine, nursing, pharmacy, public health, and dentistry. The goal of health informatics is to develop methods and systems that lead to more effective decision making. Thus, health informatics promotes the effective and efficient use and analysis of information to improve the health, well being, and economic functioning of society.

Possible areas of emphasis include:

- Health information systems
- Health Information Exchange
- Privacy and Security
- Machine learning and data mining
- User interface design
- System impact evaluation
- Database construction and analysis
- Clinical decision making
- Evaluation of health programs
- Expert systems
- Image and signal processing
- Physiological monitoring and control

All students are encouraged to discuss and explore research opportunities with their academic advisors as well as other faculty members. Faculty research interests are outlined in the [People](#) page on the IHI website, where current research profiles are available.

### **Organization**

The Health Informatics Graduate program is in the Institute for Health Informatics in the Academic Health Center. The program has a diverse faculty drawn from multiple departments and divisions throughout the University of Minnesota. The Director of Graduate Studies, assisted by the Associate Director, is responsible for the ongoing operation of the program and reports directly to the Graduate School in all matters related to the program. The Graduate School maintains the final authority concerning admissions, student progress, and the granting of degrees.

### **Degrees Offered**

In the Health Informatics program at the University of Minnesota, students take a core sequence of courses in health informatics and biostatistics, as well as electives in both technical and health science disciplines. Students follow one of three primary tracks, depending on their educational plans. The first is the Master of Health Informatics (M.H.I.), a professional degree for those already working in a healthcare setting. The second track is a Master of Science program, which is further broken down into M.S. Plan A (research-oriented) and M.S. Plan B (course-oriented) programs. Finally, we offer a Ph.D. track, which focuses on research and culminates in a dissertation.

#### M.H.I. Track (30 credits)

- The Master of Health Informatics is a course-only degree designed for working professionals who wish to upgrade their skills in their current field. The M.H.I. can be completed on a full-time or part-time basis.

#### M.S. Track (42 credits)

- The Plan A Master of Science requires a thesis and is designed and recommended only for students with special backgrounds and career objectives, such as those who have already earned a doctoral or health professional degree.
- The Plan B Master of Science substitutes additional course work and special projects for the thesis.

#### Ph.D. Track (70 credits)

- The Doctor of Philosophy in Health Informatics requires a high level of training and a dissertation and is intended for those desiring to pursue a career in academia or industry.

## **Curriculum Offerings**

The basic health informatics course sequence is taken by Health Informatics students as well as by students from other health science disciplines in the Academic Health Center. Courses designed specifically for majors emphasize advanced health informatics concepts and methodologies. Courses offered by other programs within the Academic Health Center, Institute of Technology, and School of Public Health also provide relevant experience and background. In addition, students are encouraged and required to enhance their knowledge of computer, statistical, and biological sciences by selection of special topics courses in appropriate areas.

One of the most challenging aspects of professional experience in health informatics is the high level of responsibility that may have to be assumed to resolve problems. A health informatics professional may be expected to perceive various aspects of an informatics problem and subsequently offer useful suggestions to design, implement, and manage data for problem solution. This requires an integration of formal, professional training, interpersonal elements, and communication skills.

## **Seminars**

Learning experiences are not confined to the classroom; students have the opportunity to take part in other health informatics activities. All students are required to attend the weekly Health Informatics Seminar. The Biomedical Engineering Seminar, the Laboratory Medicine and Pathology Grand Rounds, and the Microbiology and Computer Science Seminar series may also be of special interest. Attendance at seminars in related fields such as Biostatistics, Epidemiology, and Information and Decision Sciences (Management Information Systems) will add to the students' learning experiences.

## **Director of Graduate Studies**

The Director of Graduate Studies (DGS) is elected by the program graduate faculty and serves as the liaison between students and the Graduate School. Students experiencing any procedural difficulties should seek assistance from the DGS.

The faculty has given specific responsibilities to the DGS:

1. The advisor at program entry is assigned by the DGS.
2. All master's and doctoral degree programs are reviewed by the DGS. The DGS's signature is required before these are forwarded to the Graduate School.
3. The DGS arranges for an evaluation of Ph.D. thesis proposals by a faculty committee. The committee offers suggestions for improvement, modification of goals, consideration of available facilities, etc. The DGS must wait for committee suggestion before signing written and oral evaluations.

## **Health Informatics Administrative Committees**

Three Health Informatics Administrative Committees help to ensure that students have access to the highest quality educational experience. The Admissions Committee reviews applicants and recommends students for admission into the program. The Curriculum Committee routinely reviews the Health Informatics curriculum and makes formal changes as needed. The committee also reviews elective courses and recommends these to students. The Academic Progress Committee is charged with ensuring that Health Informatics students are making acceptable progress in their graduate programs.

## **Academic Progress Reports**

The Academic Progress Committee reviews each student's academic progress on an annual basis to determine if that progress is acceptable and meets the criteria established by the faculty. The results of these evaluations are conveyed to the student in the form of a letter that details the Committee's conclusions. These letters are normally distributed after the completion of each academic year. Concerns about the contents of the letter should be discussed with your faculty advisor or the Director of Graduate Studies.

## **Satisfactory Academic Progress**

To maintain satisfactory progress in the program, students must maintain a 3.0 grade point average. If a student's GPA falls below 3.0 at the end of any semester, the student will be placed on academic probation and notified by letter of that status. The student will be required to bring the GPA back to at least a 3.0 average by the end of the next semester in which she or he is registered. Failure to meet this requirement makes the student eligible for dismissal from the program upon the decision of the graduate faculty.

## **Ethical and Professional Responsibilities**

Health informatics professionals and professionals-in-training are held to high ethical standards, since they frequently deal with confidential information pertaining to human health. Ethical misconduct is grounds for dismissal from the University of Minnesota Graduate Program in Health Informatics.

Ethical guidelines for Graduate Students in Research, Scholarship, and Professional Education at the University of Minnesota are found at [http://www.grad.umn.edu/ethics/ethics\\_brochure.html](http://www.grad.umn.edu/ethics/ethics_brochure.html)

See also Mutual Responsibilities for Graduate Education at the University of Minnesota: [http://www.grad.umn.edu/faculty-staff/governance/Policies/mutual\\_responsibilities.html](http://www.grad.umn.edu/faculty-staff/governance/Policies/mutual_responsibilities.html)

The following are examples of ethical misconduct:

- Misrepresenting the work of others as your own:
  1. Using phrases, sentences, or ideas from the published works of others in your own assignments, projects, or other work and not providing proper citation.
  2. Taking the product of another person's efforts and claiming it as your own such as a written report, data, or computer code.
- Lying or making false statements:
  1. Signing your name indicating that you attended a class when you did not do so.
  2. Signing someone else's name on an attendance sheet.
  3. Submitting recommendations for admission that were not written by the person whose name appears as the recommender.
  4. Falsifying research data.
- Cheating:
  1. Working on homework assignments in groups, when instructed that the work should be done entirely on your own.
  2. Using references or consulting others in preparing answers to take-home examinations when you were instructed not to do so.
  3. Exchanging answers with other students during an in-class examination.
  4. Preparing and using written notes during an examination without the expressed consent of the instructor.
- Theft:
  1. Taking the possessions of others.
  2. Taking materials from the department without permission.
  3. Taking copies of licensed software programs without obtaining either permission or an additional license for their use.
  4. Installing and using software that is not properly licensed.
  5. Using another person's security access (username and/or password).
- Violating Security Rules:
  1. Allowing someone else to use your username and password.
  2. Loaning any security authentication mechanism assigned to you (e.g. your Ucard, building key, etc.) to others.
  3. Giving or presenting information that may identify an individual patient or human research subject to others who are not authorized to have or do not need this information.
  4. Be careful to promptly pick up material, such as faxes and photocopies, which contain confidential information and should not be left unsecured.

- Violations of Institutional Review Board guidelines for conduct of research:
  1. Revealing confidential patient data to those not authorized to view it.
  2. Changing experimental procedures without approval of the IRB.
  3. Conducting research of any type (including Plan B projects) that involve human subjects without the review and approval of the IRB.

### **Student Rights of Appeal**

Any student desiring to appeal a decision of the graduate faculty may do so by preparing a letter of appeal and submitting it to the Director of Graduate Studies. The letter should state the specific reasons why the decision should be overturned and if applicable, any steps that the student will take in response to the decision. The DGS will transmit the appeal to a graduate faculty committee for their consideration. If the graduate faculty of the program does not uphold an appeal, you may then appeal this decision to the Graduate School of the University of Minnesota.

### **Orientation**

Each fall and spring the Graduate School and the Health Informatics Graduate Program hold orientation programs for new graduate students. All new students will receive information about the Graduate School Orientation directly from the Graduate School. The Health Informatics program will also notify new students about the program's orientation session which coincides with the Graduate School's program, provides valuable information about Health Informatics, and provides students an opportunity to meet other students and faculty before beginning the semester.

## PROCEDURES

### **Course Registration**

Students must register online at <http://onestop.umn.edu/registration/index.html>. All students are encouraged to register for courses as soon as possible because some courses have limited enrollment capacity. This means new students should register as soon as they receive their official notification of admissions from the Graduate School Admissions Office. Continuing students will receive an email notification from the registrar specifying when they may register. All graduate students must register before the first day of the term in order to avoid a late registration fee.

To maintain their active status, graduate students must register every fall and spring term. Those who do not register every fall and spring are considered to have withdrawn and their Graduate School records will be deactivated. These students may not register for courses, take examinations, submit Degree Program or Thesis Proposal Forms, file for graduation, or otherwise participate in the University community as Graduate School students. Students who are not planning to take any coursework in a given semester, must register for the zero-credit, zero-tuition, non-graded GRAD 999 to maintain an active status.

For more information about registration, see the One Stop registration page: <http://onestop.umn.edu/registration/index.html>.

### **Advising**

Either the Director of Graduate Studies (DGS) or the Associate Director of Graduate Studies (ADGS) will act as an initial advisor for new students. The DGS, ADGS, and subsequent advisors will help students register for courses, develop an initial study plan, and find research opportunities within the program. Students should meet individually with graduate faculty during their first year to discuss mutual research interests in order to find the best match between their training and career goals and the ongoing activities of our faculty. Once such a match is made, students should fill out the Degree Program Transmittal (also known as the Degree Program Form) to make the advisor-advisee relationship official.

Students may change advisors at any time. New advisor-advisee relationships are personally negotiated with the assistance of the Director of Graduate Studies. Students must submit a new form to the department whenever they chose a new advisor.

### **Transfers and Waivers**

Students may have previously taken courses at another university that are equivalent to required courses in the Health Informatics program. Students may transfer up to 40% of their credits (exclusive of thesis credits) from another qualified graduate program. No more than 8 credits may be counted simultaneously toward two different masters degrees. Transfers must meet the requirements of the program and be approved by the student's advisor and the DGS. As an alternative, students may request a waiver of one or more of these required courses based on previous educational experiences; the DGS will review all such requests. In the event that a waiver is granted, the student is expected to take other coursework in order to meet the required number of credits. For the complete and specific details regarding transfers of credit, please refer to the Graduate School at [www.grad.umn.edu](http://www.grad.umn.edu).

## MASTER OF HEALTH INFORMATICS (M.H.I. Degree)

The Master of Health Informatics (M.H.I.) is a professional degree intended for health care professionals who would like training in how to guide and control the use of the many information technologies becoming more prevalent in the health care industry. This degree is designed so that it can be completed in as little as one calendar year, but may also be taken part-time over several years to accommodate professionals' work schedules.

The M.H.I. program trains students in the following competencies:

1. Knowledge of the breadth and depth of information technology in medical care.
2. Use web-based technologies to disseminate and collect health-related information.
3. Understanding the role and function of data communications in health care.
4. Ability to design and build a database application that will support patient care using a systematic software engineering process.
5. Ability to develop an information technology solution to a problem in health care using methods of systems analysis.
6. Ability to design and carry out a project to evaluate the impact and success of introducing an information system into a medical environment.
7. Knowledge of methods of decision support in health care.
8. Knowledge of the legal, ethical, and security issues in the use of medical information.

### Required Courses

#### *New Curriculum – Starting Fall 2010*

<b>Course Name</b>	<b>Course Credits</b>
HINF 5431: Health Informatics II	4
HINF 5501: Introduction to US HealthCare System	1
HINF 5436: Health Informatics Seminar	2
Database Course: HINF 5510: Applied HealthCare Databases or Principles of Databases (CSC 4707/5707) or Equivalent	3
Biostatistics (PubH 6414)	3
HINF 5520: Clinical Informatics	3
HINF 5530: Health Care Software Management	2
Electives	5
HINF 8770: Capstone Project	3
<b>Total Credits</b>	<b>30 Credits</b>

#### *Old Curriculum – Prior to Fall 2010*

<b>Course Name</b>	<b>Course Credits</b>
Biostatistics: PUBH 6414	3
Information Technology in Healthcare: PUBH 6562	2
Operations Research and Quality in Health Care: PUBH 6560	2
Seminar: HINF 5436 (two semesters)	2
Related Field Electives	6
Technical Electives	6
Capstone Project: HINF 8770	3
<b>Total</b>	<b>32 Credits</b>

### **Plan of Study**

The program includes five elective credits. Students will need to add to their repertory of methodological skills beyond the minimum required courses in order to meet the learning outcomes required by the program. Students' interests can range from technology management in a health care setting, to applications of artificial intelligence, to improving the safety of drug therapy treatments, just to name a few. The program encourages students to fulfill these elective credits by taking additional courses that correspond to their interests, whether they are in statistics, epidemiology, health services research, computer science, biomedical engineering, decision science courses, or another related field.

Students may optionally declare a formal minor as defined by another Graduate School program. If students choose to undertake a formal minor, they must meet all of the requirements of the Graduate School and the program offering the minor.

### **Capstone Project**

The program includes a three-credit Capstone course in which students will have a final opportunity to apply their newly acquired knowledge and skills to a practical problem in health informatics. In this course, students will learn how to design these projects properly, reviewing past exemplary projects as guides. Then, with the help of their advisors, students will design and carry out their own plans which can take a variety of forms, including: developing design and evaluation specifications for software to address a specific health care need; working on, observing, analyzing, and reporting the actions of a team involved in implementing a new information system; or observing and measuring the impact of such a system in a health care setting. Students will submit a written project report in lieu of a final examination. The Capstone Project instructor and the student's advisor grade the course together.

### **Elective Courses**

A wide variety of elective courses are available at the University of Minnesota covering a wide range of areas. Students seeking a course concentration or specialized expertise should discuss those possibilities with the Director of Graduate Studies or their advisor.

### **Sample MHI Programs of Study**

The following programs of study provide a sample curriculum to complete the MHI program in a single calendar year (full-time student) and in three years (part-time student). Students are free to follow these suggestions or may complete the program at their own pace.

Full time student (30 credits total):

<b>Fall Semester</b>		<b>Spring Semester</b>	
Health Informatics Methods I	4 credits	Health Informatics Methods II	4 credits
Introduction to the US HealthCareSystem	1 credit	Clinical Informatics	2 credits
Health Informatics Seminar	1 credit	Health Informatics Seminar	1 credit
Database Course (HINF 5510/CSC5707)	3 credits	Health Care Software Management	2 credits
Biostatistics (PubH 6414)	3 credits	Electives	4 credits
Electives	2 credits		
<b>Total Credits</b>	<b>14</b>	<b>Total Credits</b>	<b>13</b>

<b>Summer Semester</b>	
Capstone Project	3 credits
<b>Total Credits</b>	<b>3</b>

Part Time Student (30 credits total):

<b>Year 1 Fall Semester</b>		<b>Year 1 Spring Semester</b>	
Health Informatics Methods I	4 credits	Health Informatics Methods II	4 credits
Health Informatics Seminar	1 credit	Clinical Informatics	2 credits
<b>Total Credits</b>	<b>5</b>	<b>Total Credits</b>	<b>6</b>

<b>Year 2 Fall Semester</b>		<b>Year 2 Spring Semester</b>	
Database Course	3 credits	Biostatistics (PubH 6414)	3 credits
Introduction to Medicine	1 credit	Health Informatics Seminar	1 credit
		Health Care Software Management	2 credits
<b>Total Credits</b>	<b>4</b>	<b>Total Credits</b>	<b>6</b>

<b>Year 3 Fall Semester</b>		<b>Year 3 Spring Semester</b>	
Electives	4 credits	Electives	2 credits
		Capstone Project	3 credits
<b>Total Credits</b>	<b>4 credits</b>	<b>Total Credits</b>	<b>5</b>

### **Graduation Requirements**

In order to graduate from the program students must complete at least 30 credits of coursework including the Capstone with a GPA of 3.0. The Graduate School will award the M.H.I. degree to students completing these requirements.

**Administrative Milestones**

The following table lists the actions that must be taken, by whom and when in order to complete the M.H.I. Degree program.

<b>Action</b>	<b>Form</b>	<b>Action Date</b>	<b>Initiator</b>	<b>Approval</b>	<b>Destination</b>
Submit Plan of Study	Degree Program Transmittal	By the time 10 credits are completed	Student	Advisor, DGS	GS
Notify Advisor and Capstone Project Director that the project report is ready for review		Any time after enrollment in the Capstone Project	Student		CC
File Capstone Project Grade Report		After report is approved and a grade is assigned	Capstone Project Director	CPD	GS
File Graduation Forms	Application for Degree form	On or before the first work day of the month in which graduation is desired	Student		GS

Legend: CC = Capstone Project Committee (Advisor and Project Director), CPD – Capstone Project director), DGS = Director of Graduate Students, GS = Graduate School

**MASTER OF SCIENCE DEGREE PLAN A (RESEARCH-ORIENTED)**

The Plan A program is designed for health professionals who are seeking additional training in health informatics. It requires a total of 42 semester credits including preparation and defense of a Master's Thesis.

**Required Courses*****New Curriculum – Starting Fall 2010***

<b>Course Name</b>	<b>Course Credits</b>
Health Informatics: HINF 5430, 5431	8
Biostatistics—1 year sequence (6414/6415 or 6450/6451)	6-8
HINF 5501: Introduction to US HealthCare System	1
Database course: HINF 5510, CSC 4707/5707 or equivalent	3
HINF 5520: Clinical Informatics and Patient Safety	2
HINF 5530: Health Care Software Management	2
Seminar: HINF 5436 ( two semesters)	2
Related Field Electives	6-8
Technical Electives	6
HINF Plan B Thesis	4
<b>Total</b>	<b>42 Credits</b>

***Old Curriculum – Prior to Fall 2010***

<b>Course Name</b>	<b>Course Credits</b>
Health Informatics: HINF 5430, 5431	8
Biostatistics: PUBH 6450, 6451 or equivalent	8
Information Technology in Healthcare: PUBH 6562	2
Operations Research and Quality in Health Care: PUBH 6560	2
Seminar: HINF 5436 (two semesters)	2
Related Field Electives	10
Master's Thesis Research Credits	10
<b>Total</b>	<b>42 Credits</b>

## **Plan of Study and Examining Committee**

All students must develop a Plan of Study that lists the courses that have or will be taken to meet the degree requirements. Students should prepare this with their advisors to ensure that they are meeting all of the program requirements and achieve their educational objectives.

At the same time, students are required to submit a list of three graduate faculty members who will serve on their thesis Examining Committee. The Examining Committee consists of three qualified members of the Graduate Faculty: the student's advisor, one other Health Informatics faculty member, and one faculty member from outside the program. The student's advisor must be a member of the Health Informatics faculty. The outside member is most often from the minor area or area of specialization. The committee members are nominated by the student and his or her advisor, approved by the DGS, and appointed by the Graduate School. The committee also serves in an advisory role during the execution of the Master's thesis project.

## **Research Project**

Students are required to prepare and defend a thesis. Students should explore and discuss research topic possibilities with their academic advisors as well as other faculty members. They should look beyond their courses, attend seminars, and read pertinent journals so they are well informed when they pick their thesis topic. The proposal should contain a research hypothesis, a statement of significance, background material, a current bibliography, a possible methodology to be used or developed, and the anticipated results. Students should discuss specific details regarding proposed format, length, and level of detail with their advisors. It is beyond the scope of this handbook to attempt a comprehensive description of thesis efforts. Bound copies of M.S. - Plan A theses may be found in the Collaboratory, Room 330, Diehl Hall.

## **Examination**

Students are required to take a final oral examination in defense of their research thesis conducted according to the rules established by the Graduate School. Students are responsible for both the content of the thesis and the course work listed on their approved program of study.

## **Graduation Requirements**

In order to graduate from the program with a M.S. Plan A degree, students must complete at least 42 credits of coursework with a GPA of at least 3.0 and must successfully defend their Masters Thesis.

## Administrative Milestones

The following table lists the actions that must be taken, by whom, and when in order to complete the Plan A Masters Degree program.

<b>Action</b>	<b>Form</b>	<b>Action Date</b>	<b>Initiator</b>	<b>Approval</b>	<b>Destination</b>
Submit Plan of Study, nomination of Examination Committee and thesis title	Degree Program Transmittal	After 10 credits are completed	Student	DGS	GS
Plan of Study approval and Examination Committee appointment			GS		Student
Notify Examination Committee that the thesis is ready for review		At least 4 weeks prior to defense	Student		EC
Distribute thesis to the Examination Committee	Thesis draft	At least 2 weeks prior to defense	Student		EC
Pick up graduation packet from Graduate School	Several	At least 2 weeks prior to defense	Student		Student
Receive and distribute thesis reviewers report form and distribute to Examination Committee	Thesis Reviewer's Report	At least 2 weeks prior to defense	GS		Student
Set time and place of examination		At least two weeks prior to defense	Student		GS
Exchange Thesis Approval form for final examination form	Final Examination Report form	At least 1 day prior to defense	GS	EC	Student
Submit examination results	Signed Final Examination Report form	Last working day of the intended month of graduation	Student	EC	GS
File Graduation Forms	Application for Degree form	On or before the first work day of the month in which graduation is desired	Student		GS
Deliver unbound thesis copies Graduate School (2)	Unbound and signed thesis	Prior to graduation	Student	Advisor	GS Advisor
Legend: EC = Examining Committee, DGS = Director of Graduate Studies, GS = Graduate School					

**MASTER OF SCIENCE DEGREE PLAN B (COURSE-ORIENTED)**

The Plan B program is intended for non-health professionals who wish to be trained in the area of Health Informatics but need additional coursework to become fully qualified.

**Required Courses**

*New Curriculum – Starting Fall 2010*

<b>Course Name</b>	<b>Course Credits</b>
Health Informatics: HINF 5430, 5431	8
Biostatistics: PUBH 6414, 6415 or 6450/6451	6-8
Database course: HINF 5510, CSC 4707/5707 or equivalent	3
HINF 5520: Clinical Informatics and Patient Safety	2
HINF 5501: Introduction to US HealthCare System	1
HINF 5530: Health Care Software Management	2
Seminar: HINF 5436 ( two semesters)	2
Related Field Electives	5-7
Technical Electives	7
HINF Plan B Thesis	4
<b>Total</b>	<b>42 Credits</b>

*Old Program – Prior to Fall 2010*

<b>Course Name</b>	<b>Course Credits</b>
Health Informatics: HINF 5430, 5431	8
Biostatistics: PUBH 6414, 6415 or 6450/6451	6-8
Information Technology in Healthcare: PUBH 6562	2
Operations Research and Quality in Health Care: PUBH 6560	2
Seminar: HINF 5436 ( two semesters)	2
Related Field Electives	10
Technical Electives	6-8
HINF Plan B Thesis	4
<b>Total</b>	<b>42 Credits</b>

## **Plan of Study and Examining Committee**

All students must develop a Plan of Study that lists the courses that have or will be taken to meet the degree requirements. Students should prepare this plan of study with their advisors to ensure that they are meeting all of the program requirements in a coherent manner that also achieves their objectives.

At the same time, the student is required to submit a list of at least three graduate faculty members who will serve on his or her Plan B Project Examining Committee. The Examining Committee consists of three qualified members of the Graduate Faculty: the student's advisor, one other Health Informatics faculty member, and one from outside the program. The advisor must be a member of the Health Informatics faculty. The outside member is most often from the minor area or area of specialization. The committee members are nominated by the student and his or her advisor, approved by the DGS, and appointed by the Graduate School.

## **Research Project**

Students must complete an independent project focused on a health informatics application, culminating in a written report. The general Graduate School requirement is that "students must demonstrate familiarity with the tools of research or scholarship in the field, the ability to work independently, and the ability to present the results of investigation effectively, by completing at least one Plan B project. The graduate faculty in each major field may require as many as three such projects, equivalent to approximately 120 hours of work." Copies of previous Plan B papers are available in the Collaboratory, Room 330, Diehl Hall. In general, advisors are responsible for approving the project(s), determining relative worth for satisfying the entire requirement, and specifying how students will share their findings with their Examining Committee.

## **Examination**

A final oral examination is required. Students are responsible for both the content of the Plan B project(s) and the course work listed on their approved program of study.

## **Graduation Requirements**

In order to graduate from the program students must complete at least 42 credits of coursework with a GPA of 3.0 and successfully defend their plan B project. The Graduate School will award the M.S. degree to students completing these requirements.

## **Administrative Milestones**

The following table lists the actions that must be taken, by whom, and when in order to complete the Plan B Master's Degree program.

<b>Action</b>	<b>Form</b>	<b>Action Date</b>	<b>Initiator</b>	<b>Approval</b>	<b>Destination</b>
Submit Plan of Study and nominations for the Examining Committee	Degree Program Transmittal	By the time 10 credits are completed	Student	DGS	GS
Plan of Study approval and Examining Committee appointment			GS		Student
Notify Examining Committee that the project is ready for review		At least 4 weeks prior to defense	Student		EC
Distribute project report to the Examining Committee	Draft report	At least 2 weeks prior to defense	Student		EC
Set time and place of examination		At least two weeks prior to defense	Student		GS
Obtain the examination report form as part of the graduation packet	Final Examination Report form	At least 1 day prior to defense	GS	EC	Student
Submit examination results	Signed Final Examination Report form	Last working day of the intended month of graduation	Student	EC	GS
File Graduation Forms that are part of the graduation packet	Application for Degree form	On or before the first work day of the month in which graduation is desired	Student		GS
Legend: EC = Examination Committee, DGS = Director of Graduate Studies, GS = Graduate School					

**DOCTOR OF PHILOSOPHY DEGREE (Ph.D.)**

The Ph.D. program of study is designed for students seeking the highest level of advanced training in the area of health informatics. It is a degree where students apply coursework to an original research project that is reported in the doctoral thesis. Progress toward the Ph.D. requires that the student first apply and be admitted to the Ph.D. program. Students who desire admission to the Ph.D. program should discuss the process with their advisor. At a suitable time, determined by the student in consultation with their advisor after completing most or all of the required Ph.D. coursework, the student should take the Preliminary Written Examination. If successfully completed, then the student should take the Preliminary Oral Examination. Successful completion of both these examinations will admit the student to Candidacy for the Doctor of Philosophy degree. Once candidacy is attained, the student undertakes the research and writing activities that lead to the doctoral thesis. After the thesis is approved for defense by the examining committee and successfully defended in a public oral defense, the doctoral degree is granted.

**Program Requirements**

It is expected that Ph.D. students will have completed all of the core courses for the Master of Science degree or will have engaged in coursework at other institutions that is equivalent to these core courses. If the student has a master’s degree from another institution, the core requirements will be waived to the extent that the coursework matches the required core.

**Required Courses**

<b>Course Name</b>	<b>Course Credits</b>
Health Informatics I	4
Health Informatics II	4
Introduction to US HealthCare System	1
Health Informatics Seminar	2
Database Course (5510/4707/5707)	3
Statistics ( approved sequence)	8
Clinical Informatics	2
Health Care Software Management	2
Informatics Research Study Design or equivalent	3
Health Informatics Teaching	2
Thesis Credits	24
Elective	15
<b>Total Credits</b>	<b>70 Credits</b>

In addition, the 10 elective credits must constitute a formal minor or constitute a supporting program. A supporting program is defined as a coherent pattern of courses outside of the health informatics graduate program.

## **Plan of Study and Examining Committee**

Each doctoral student is required to develop a Plan of Study that lists the courses that have or will be taken to meet the degree requirements. Students should prepare this Plan of Study with their advisor to insure that they are meeting all of the program requirements in a coherent manner that also achieves their objectives.

At the same time, the student is required to submit a list of at least four graduate faculty members who will serve on his or her preliminary examining committee. One individual, *other than the student's advisor*, is appointed as chair, and one member of the committee must be a member of a graduate program other than Health Informatics. The advisor must be a member of the Health Informatics faculty.

## **Preliminary Written Examination (PWE)**

Students are required to pass the Preliminary Written Examination (PWE) in Health Informatics in order to be considered for Ph.D. candidacy. Students who take the PWE and fail it can take it one additional time. It can be taken no more than two times.

### **Eligibility:**

All students who have completed their first year of courses in the HI graduate program and have demonstrated the ability to do outstanding work by obtaining a grade point average greater than 3.5 in first-year core courses are offered the opportunity to take this examination. Any incomplete or missing grades for first-year core courses must be complete and made available to the PWE committee through transcript or miscellaneous grade report. For students who were excused from some of the first-year core courses, qualifying GPA will be based only on the first-year core courses that have been completed. Those students who meet the qualifications and are interested in taking the examination for the first time should list their name, the first year core courses they have taken, when they took them, and their grades in these courses, and give the list to the HI Administrative Assistant when they turn in the PWE proposal (see below).

In addition, students must discuss the formation of a Preliminary Oral Examination (POE) Committee with their advisor, and recommend members of this committee to the DGS a minimum of one month prior to the submission of the PWE proposal. The DGS will appoint the POE committee.

### PWE Structure and Content:

The PWE will consist of an original research proposal which should include 1) an original hypothesis about a problem in the field of health informatics; 2) a critical review of relevant literature leading to the stated hypothesis; 3) a statement regarding the significance of the problem; 4) a process or procedures for data collection to test this hypothesis; and 5) a discussion of anticipated results and alternative possibilities. Students are encouraged to consider a wide range of techniques and methodologies to evaluate the validity of the hypothesis. The total length of the proposal is limited to 30 pages of double-spaced, 12 point Times New Roman font with 1 inch margins (excluding references). The following format (approximate page count in parentheses) should be used:

- I. Background and Significance (10 pages)
- II. Specific Aims, including statement of hypothesis (2 pages)
- III. Experimental Design & Data Collection (10 pages)
- IV. Anticipated Results and Alternatives (4 pages)
- V. Summary and Future Directions (4 pages)
- VI. References

### Rules to be followed when Writing the PWE:

Since this is an examination, the proposal must be of the student's own creation. Students may not use any research grant application written by their advisor in preparing the proposal. It is the student's responsibility to choose the topic of the proposal. The topic may be the student's intended thesis research, related to that research, or some unrelated topic. The scope should represent a 3-4 year project that can be completed by an individual. Students are encouraged to consult with members of the examining committee in developing ideas however the WPE must be the student's own work.

### The PWE Process is as follows:

1. Submit an "Intent to take the PWE" letter 30 days before submission of the PWE to the DGS that lists:
  - a. Your name
  - b. A copy of your Plan of Study and Examining Committee Appointment forms
  - c. The title and a brief abstract of the intended PWE
2. Submit the completed PWE 30 days after the submission date of the "Intent to take the PWE" letter.
3. The student's PWE committee will grade the examination within 30 days of its submission date according to the grading scheme below.
4. Every time the student resubmits the PWE for review (whether as a revision in response to **Acceptable with Revisions**) or as an entirely new submission (in response to **Unacceptable**), the student has 30 days to resubmit and the committee has 30 days to review.
5. If the final outcome is **Acceptable**, the student's advisor will prepare the Preliminary Written Examination Report form and submit it to the DGS, who will forward it to the Graduate School.
6. If the final outcome is **Unacceptable**, the student's academic record and PWE performance will be submitted for review by Graduate Faculty and the student is subject to dismissal from the program.

## Grading:

The PWE will be graded by an ad hoc committee of three Health Informatics faculty members. These will include the two faculty members from the student's Preliminary Oral Examining Committee, excluding the advisor, and one faculty member chosen by the PWE Committee. This committee will review the PWE and assign it one of three outcomes:

- **Acceptable** – the student passes the preliminary written examination.
- **Acceptable with Revisions** – the proposal is generally acceptable but must be revised according to the committee's recommendations and must then be re-evaluated.
- **Unacceptable** – the proposal contains fundamental flaws or is too poorly written to be acceptable.

There is an opportunity for a second review (round 2) for students who receive a grade of **Unacceptable**.

## Grading Processes:

Round 1, Grade is **Acceptable**: The student has successfully completed the PWE.

Round 1, Grade is **Acceptable with revisions**: The student must revise the PWE according to the directions of the committee and submit the revised PWE for evaluation. The only allowable new grades for the revised PWE are **Acceptable** or **Unacceptable** during Round 1.

Round 1, resubmission of **Acceptable with revisions**, grade is **Acceptable**: The student has successfully completed the PWE.

Round 1, resubmission of **Acceptable with revisions**, grade is **Unacceptable**: Student revises the PWE based upon advice from the committee or creates a new PWE and submits it for Round 2.

Round 1, grade is **Unacceptable**: Student revises the PWE based upon advice for the committee or creates a new PWE and submits it for Round 2.

Round 2, grade is **Acceptable**: The student has successfully completed the PWE.

Round 2, grade is **Acceptable with revisions**: The student must revise the PWE according to the directions of the committee and submit the revised PWE for evaluation. At this point, the only allowable new grades are **Acceptable** or **Unacceptable**.

Round 2, resubmission of **Acceptable with revisions**, grade is **Acceptable**: The student has successfully completed the PWE.

Round 2, resubmission of **Acceptable with revisions**, grade is **Unacceptable**: The student has failed the PWE and is subject to dismissal from the program.

Round 2, grade is **Unacceptable**: The student has failed the PWE and is subject to dismissal from the program.

### **Preliminary Oral Examination (POE)**

Once the student successfully completes the PWE with a grade of Acceptable, he or she is eligible to take the Preliminary Oral Examination. After notification from the DGS that the student has passed the PWE, the student must schedule the Preliminary Oral Examination with the Graduate School online. [http://www.grad.umn.edu/current\\_students/prelimschedule/](http://www.grad.umn.edu/current_students/prelimschedule/). This must be *no later than* one week prior to the actual examination.

In the POE, the student presents his or her thesis proposal based on the PWE to the Examining Committee and is also responsible for the material covered in the approved program of student coursework already completed, including the courses in the minor or related field section of the program. The student is encouraged to solicit comments from all members of the POE committee concerning the proposal. The POE is a private session with only the student and the POE committee present.

The committee for the examination consists of at least four members, one from a field other than the major. The examination will commence with a defense of the PWE proposal. If the PWE proposal is unrelated to the thesis proposal, the POE must also include a defense of the thesis proposal. However, the examination is intended to be open-ended and may delve into other areas. In particular, members of the examining committee representing the minor or other supporting program may evaluate the student for his/her breadth of knowledge.

The student must schedule her or his Preliminary Oral Examination for a date within a period of one year from the PWE submission, and he or she must inform the DGS of this date. It is the student's responsibility to consult the committee members to schedule a suitable date for the examination and to reserve a room through the IHI Office. The student's Degree Program Transmittal form and Degree Program form should have been previously filed with the Graduate School. At least one week prior to the POE, the student needs to file the Doctoral Preliminary Oral Examination Scheduling form with the Graduate School. If the POE is not scheduled within one year from date of passing the PWE, the student's advisor must request an extension from the DGS.

The following steps are required:

1. The student should distribute the PWE to his or her advisor and any other members of the POE committee who have not participated in the grading of the PWE.
2. The student will consult with members of the POE committee to schedule a two hour time block during which *all* members must be present.
3. Notify the Graduate School of the date of the POE at least one week prior to the scheduled date.
4. Take the Preliminary Oral Examination.
5. Submit the Report of the Preliminary Oral Examination to the Graduate School.

The result of the POE is one of the following:

- **Pass** – the student passes the POE and is admitted to Candidacy for the Ph.D.
- **Pass with Reservations** – The student is informed immediately of the decision and will receive within one week a letter detailing the actions the student must take to remove those reservations. When, in the judgment of the committee, the student has satisfactorily completed those actions, the student receives a grade of Pass.
- **Fail** – the student will be excluded from candidacy unless the committee unanimously recommends that the student retake the POE.
- **Recess of the POE** – The committee may elect to recess the POE and resume again at a later date. See the Graduate Catalog for the rules concerning such a recess.

### **Research Project**

For the Ph.D. thesis, the research project is based on the proposal approved by the Examining Committee during the Preliminary Oral Examination. The results of this project are prepared in written form in the Doctoral Thesis. Specific details regarding proposed format, length, and level of detail should be developed with the student's advisor. Bound copies of Ph.D. theses may be found in the Biomedical Library. Formatting instructions can be found at [http://www.grad.umn.edu/current\\_students/forms/gsl6.pdf](http://www.grad.umn.edu/current_students/forms/gsl6.pdf).

### **Final Oral Examination**

The format of this examination as required by the Graduate School is fully described in the [Graduate School Bulletin](#). The student is strongly urged to consult frequently with the members of their committee during the research and writing process that leads to the thesis. The Final Oral Examination takes the form of a seminar in which the candidate presents the thesis and to which the scholarly community is invited. The examination is limited to the candidate's thesis topic and related areas.

The following is a summary of the Final Oral Examination process:

1. The Graduate School will appoint the Final Oral Examining Committee that will include three thesis reviewers – the student's advisor, a representative of the program major, and a representative of the minor program or field of specialization.
2. The student is responsible for arranging a date for the thesis defense with the members of the committee at which *all* members *must* be present, but that presence may be by telephone or videoconference.
3. The student will advise all members of the committee of the date on which the thesis will be delivered to them. The notification should take place at least two weeks prior to that delivery and at least three weeks before the defense.
4. On the delivery date, the student must deliver the thesis to all members of the committee. The thesis reviewers will have two weeks to review the thesis and make a determination as to its readiness for the defense.
5. The student will deliver the approved Thesis Reviewers' Report form to the Graduate School.
6. The Graduate School will appoint a chair of the committee who is *not* the student's advisor and deliver the examination forms to that person.

7. At the completion of the Final Oral Examination, the committee will complete the required forms and submit them to the Graduate School within 24 hours of the examination.
8. The copies of the thesis required by the Graduate School are delivered to the Graduate School after the advisor signs the cover page approving the final copy, indicating that all corrections have been made.

### Administrative Procedures

The following table lists the actions that must be taken, by whom and when in order to complete the Ph.D. Degree program. Please also see the graduate school for a PhD completion checklist. [http://www.grad.umn.edu/current\\_students/doctoral/phdeddchecklist.html](http://www.grad.umn.edu/current_students/doctoral/phdeddchecklist.html)

Action	Form	Action Date	Initiator	Approval	Destination
Submit Plan of study, nomination of preliminary oral Examining Committee <a href="http://www.grad.umn.edu/current_students/forms/g89a.pdf">http://www.grad.umn.edu/current_students/forms/g89a.pdf</a>	Degree Program Transmittal	One semester before the POE	Student	DGS	GS
Submit the "Intent to take the PWE" form	Program form	At student and advisor's discretion--30 days prior to PWE submission.	Student	Advisor	DGS
Submit the PWE		30 days after submitting Intent Form	Student		DGS
Submit the PWE report form <a href="http://www.grad.umn.edu/current_students/forms/GS17.pdf">http://www.grad.umn.edu/current_students/forms/GS17.pdf</a>	Preliminary Written Examination Report form	When final grade of PWE is determined but at least one week before the POE	DGS		GS
Schedule the Preliminary Oral Examination with the Graduate School ( <a href="http://www.grad.umn.edu/current_students/prelimschedule/">http://www.grad.umn.edu/current_students/prelimschedule/</a> )	Doctoral Preliminary Oral Examination Scheduling	Within 12 months of PWE submission and at least one week before the exam. Must also be at least one academic term (15 weeks) before the Final Oral Defense.	Student		EC
Submit the POE examination report form	POE Report form	Within one working day of POE.	EC		GS
File thesis proposal form <a href="http://www.grad.umn.edu/current_students/forms/GS63A.PDF">http://www.grad.umn.edu/current_students/forms/GS63A.PDF</a>	Thesis Proposal form	No later than the first semester after the POE is passed	Student		GS
Request graduation packet from the graduate school <a href="http://www.grad.umn.edu/current_students/forms/grad_packet/doctoral/confirm.html">http://www.grad.umn.edu/current_students/forms/grad_packet/doctoral/confirm.html</a>	Several including the Thesis Reviewer's Form	After the Thesis Proposal form has been approved	Student		Student
Register the thesis title and obtain thesis reviewers report form	Thesis title page & Thesis Reviewer's Report form	Before distributing thesis to the committee	Student		GS
Notify committee that the thesis is ready for review		At least 4 weeks prior to defense	Student		EC

<b>Action</b>	<b>Form</b>	<b>Action Date</b>	<b>Initiator</b>	<b>Approval</b>	<b>Destination</b>
Distribute thesis to the committee	Thesis draft	At least 3 weeks prior to defense	Student		EC
Submit Thesis Reviewer's form and set time and place of the examination (part of the graduation packet)	Thesis Reviewer's Form	At least one week prior to the defense	Student		GS
Submit examination results	Signed Final Oral Examination Report form	Within one working day of completion of the oral defense	EC		GS
File Graduation Forms	Application for Degree form	On or before the first work day of the month in which graduation is desired	Student		GS
Deliver a thesis copy to Graduate School	signed thesis	Last working day of the intended month of graduation	Student	Advisor	GS Advisor Program
Legend: EC = Examining Committee, DGS = Director of Graduate Students, GS = Graduate School.					

**APPENDIX A – MHI Project Cover Page**

**Sample Format for Cover Page of MHI Project Paper**

**(Title)**

**MHI PAPER  
SUBMITTED TO THE GRADUATE PROGRAM  
IN HEALTH INFORMATICS  
AT THE UNIVERSITY OF MINNESOTA**

**BY  
(Name)**

**IN PARTIAL FULFILLMENT OF THE REQUIREMENTS  
FOR THE DEGREE OF MASTER OF HEALTH INFORMATICS**

**(Date)**