Graduate Program in Health Informatics

Student Handbook

Degrees:
Master of Health Informatics (MHI)
Master of Science, Plan A and Plan B (MS)
Doctor of Philosophy (PhD)

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GENERAL INFORMATION

This handbook describes important characteristics of the graduate program in Health Informatics. General Graduate School requirements are also provided. A more detailed discussion of the Graduate School's rules and procedures will be found in the Graduate School Bulletin and on the graduate school website – www.grad.umn.edu. Questions may be directed to your advisor, the Director of Graduate Studies (DGS), the program secretary, other faculty members or the Graduate School administrative staff at 316 Johnston Hall. See also the program home page at www.hinfgrad.umn.edu.

Program

The heart of the health-care delivery system in the United States is the interaction between the individual health care professional and a patient. From this interaction flow decisions and actions by both the professional and the patient that affect the well being of the patient, the economic vitality of both parties, and the social and economic context within which they function. Our entire system of health care is based on these interactions and their documentation in clinical records that are being transformed into computer-based information systems. Driven by the escalating costs of medical care, a growing knowledge base and evidence of deficient quality, there is a critical need to develop information systems that lead to more effective decisions and more efficient actions. Meeting this need requires an interdisciplinary collaboration of scholars from the fields of computer, information, management and cognitive sciences with knowledgeable practitioners from areas including medicine, nursing, pharmacy, public health and dentistry. This is the interdisciplinary field of health informatics whose ultimate goal is to develop methods and systems that lead to more effective decisions and actions that are made and taken with greater efficiency. Thus Health Informatics is an interdisciplinary field of scholarship that applies computer, information and cognitive sciences to promote the effective and efficient use and analysis of information to improve the health, well being and economic functioning of society.

In the Health Informatics program at the University of Minnesota students take a core sequence in health informatics and biostatistics, as well as electives in both technical and health science areas. A professional Master of Health Informatics degree, research and course-oriented MS degrees and the Ph.D. degree are offered.

Possible areas of emphasis include health information systems, user interface design, system impact evaluation, database construction and analysis, clinical decision making, evaluation of health programs, expert systems, image and signal processing, and physiological monitoring and control. All students are encouraged to discuss and explore research possibilities with their academic advisor as well as other faculty members. Faculty research interests are outlined in the Faculty section of this handbook. A number of classes are offered for graduate credit by the Health Informatics graduate program each year, including its own weekly seminar series. These courses are taught by the graduate faculty members of the program.
Organization

The Health Informatics Graduate program is under the purview of the University of Minnesota Graduate School which supervises the vast majority of the graduate programs at the University. Its home is in the Institute of 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 is responsible for the on-going operation of the program and reports directly to the Graduate School in all matters related to the program. The Graduate School maintains final authority concerning admissions, student progress, and the granting of degrees.

Degrees Offered

Four programs of study are offered under the administration of the Graduate School.

- The Master of Health Informatics (MHI) is a course only degree designed for the working professional who wishes to upgrade their skills in a program that can be completed on a full time or part time basis.

- 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 doctorate or health professional degree.

- The Plan B Master of Science substitutes additional course work and special projects for the thesis.

- The Ph.D. Program requires a high level of training and a dissertation and is intended for those desiring to pursue a research 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 numerous 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 Health Sciences, Institute of Technology, and School of Public Health provides some of the relevant experience and background. In addition, students are encouraged and/or required to enhance their knowledge of computer, statistical and biological sciences to the extent that each individual program allows by election 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, which may have to be assumed in the resolution of a new problem. A health informatics professional may be expected to perceive various important aspects of the informatics problem rather quickly and then to make useful suggestions as to the design, implementation and/or data management of the system needed for problem solution. The ability to do so requires an integration of formal professional training together with interpersonal elements and communication skills.
Learning experiences are not confined to the classroom, but also are provided by various Health Informatics activities. All students are urged to attend the weekly Health Informatics Seminar. The Biomedical Engineering Seminar, the Laboratory Medicine and Pathology Grand Rounds and the Microbiology and the 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 help to serve the same purpose.

**Director of Graduate Studies**

The Director of Graduate Studies (DGS) is elected by the program graduate faculty and has liaison responsibilities between the students of the program 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 Masters 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's signature of approval cannot be given without committee action.

4. The DGS is responsible for an equitable distribution of faculty appointments to examining committees. This may result in modification of some of the suggestions for examining committees that are submitted by student and advisor.

**Academic Progress Reports**

Each student’s academic progress is reviewed annually by the graduate faculty to determine if that progress is satisfactory and meets the criteria established by the faculty. The results of this evaluation are conveyed to the student in the form of a letter that reports on the faculty’s conclusions. These letters are normally distributed in late June of each academic year. If you have concerns about the contents of the letter you receive, you should discuss those concerns with your faculty advisor or the Director of Graduate Studies.

**Satisfactory Academic Progress**

Satisfactory progress in the program will be considered to be maintenance of a 3.0 grade point average. If the 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

Dealing as they frequently do with confidential information that involves human health, health informatics professionals and professionals-in-training must be held to the very highest ethical standards. Ethical misconduct is grounds for dismissal from the University of Minnesota Graduate Program in Health Informatics.

Expectations for Graduate Students in Research, Scholarship, and Professional Education at the University of Minnesota are found at: http://www.grad.umn.edu/gsss/ethics_brochure.html

See also Mutual Responsibilities for Graduate Education at the University of Minnesota: http://www.grad.umn.edu/faculty/mutual.html

The following are examples of what is considered to be 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 indicating that others created them. Be careful to put exact quotes in quote marks.

2. Taking the product of another person’s efforts and claiming it as your own such as handing in a written report prepared by someone else, taking someone’s data that they generated in an experiment or taking someone else’s computer code and submitting it as your own work.

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 when they were not there.
3. Submitting recommendations for admission that were not written by the person who name appears as the recommender.
4. Falsifying research data.

Cheating:

1. Working on homework assignments in a group, when you were specifically instructed that the work should be entirely 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) without their permission.

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. To give or present 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. Be careful to promptly pick up material, such as faxes and photocopies, which contain such confidential information and do not leave it 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 the 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. That 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 the graduate faculty for their consideration. If an appeal is not upheld by the graduate faculty of the program, you may then appeal this decision to the Graduate School of the University of Minnesota.

Orientation

Orientation programs are held for new graduate students each Fall and Spring by the Graduate School and each Fall by the Health Informatics Graduate Program. All new students will receive information about the Graduate School Orientation directly from the Graduate School. The program will also notify new students about the program’s orientation session which coincides with the Graduate School’s program and provides valuable information about Health Informatics and provides an opportunity to meet the other students and faculty before the beginning of the semester.
PROGRAMS OF STUDY

All registration is conducted through the University’s website at onestop.umn.edu. New students are strongly encouraged to register for the core sequence beginning in the Fall semester as soon as they receive their official notification of admission. Some courses have restricted enrollment, which may make it essential to register early. Previously registered students are notified by Admission and Records of registration dates. The Graduate School has materials on its website explaining the details of registration. The Graduate School requires that each student maintain an active registration for each Fall and Spring semester of an academic year or else they are dropped from active status and have to apply for readmission. If the student is not taking any coursework, he or she may maintain active status by registering for the zero tuition, non-graded option – GRA 999.

Advising

Upon entering the program, you are assigned a temporary advisor who will help you register for courses, develop an initial study plan, and advise you regarding research opportunities within the program. You are encouraged to meet individually with graduate faculty during your first year to discuss mutual research interests, so that you may find a best match between your training and career goals and the ongoing activities of our faculty. Once such a match is made you should request that the Director of Graduate Studies assign that faculty member as your permanent advisor.

Students may change advisors at any time without prejudice. Students may discover a special interest that becomes the basis for Plan B project or thesis efforts as they progress through the program. It is perfectly natural and expected behavior to seek out an advisor whose special background is most compatible with these developing interests. However, at any one time, a faculty member may have an unusual research, teaching and advising load. As a consequence, new advisor/advisee relationships are personally negotiated with the assistance of the Director of Graduate Studies.

Transfers and Waivers

Students may have covered some of the material with previous equivalent courses before entry in the graduate program. Up to 40% of the credits (exclusive of thesis credits) for the applicable degree may be transferred from another qualified graduate program. No more than 8 credits may be counted simultaneously toward two different master’s degrees. Such transfers must meet the requirements of the program and be approved by your advisor and the DGS. As an alternative the student may request a waiver of one or more of these required courses based on previous educational experiences. The DGS will review and must approve 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.
MASTER OF HEALTH INFORMATICS

The role informatics plays in modern medical care continues to expand. Physicians, pharmacists, dentists, nurses and veterinarians make constant use of computer-based information systems to maintain patient records, order and carry out treatment programs, review and monitor patients and collect payments for their services. Recent private and federal government initiatives to improve the safety of patient care have focused heavily on the use of information technology. The applications of computer technology are a significant and everyday component of practice in all areas of care. Yet most professionals in practice today have had no training that either enables them to understand and cope with the onslaught of technological developments or to guide and control the use of the technologies in their profession.

Consequent to extensive deliberations, the faculty of the program has determined that a professionally oriented Master of Science program under the governance of the Health Informatics graduate program could be completed in one calendar year with classes that are closely aligned with the schedules of working health professionals.

The MHI program is designed to train students in the following competencies:

1. Knowledge of the breadth and depth of information technology applications in medical care.
2. Ability to use web-based technologies to disseminate and collect health-related information.
3. Understanding of 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.
8. Knowledge of the legal, ethical and security issues in the use of medical information.

Course Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Informatics: HINF 5430, 5431</td>
<td>8</td>
</tr>
<tr>
<td>Biostatistics: PUBH 6414</td>
<td>3</td>
</tr>
<tr>
<td>Information Technology in Healthcare: PUBH 6762</td>
<td>2</td>
</tr>
<tr>
<td>Operations Research and Quality in Health Care: PUBH 6560</td>
<td>2</td>
</tr>
<tr>
<td>Seminar: HINF 5436</td>
<td>2</td>
</tr>
<tr>
<td>Technical Electives</td>
<td>6</td>
</tr>
<tr>
<td>Related Field Electives</td>
<td>6</td>
</tr>
<tr>
<td>Capstone Course: HInf 5499</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>32 Credits</strong></td>
</tr>
</tbody>
</table>
The program will include six credit hours of technical electives that all students will need to add to their repertory of methodological skills beyond the minimum of required courses in order to meet the learning outcomes required in the program. Depending on their area of interest the program will encourage MHI students to take additional statistics, epidemiology, health services research, computer science, biomedical engineering or decision science courses. Students will generally take two three-credit courses to satisfy the component of the program.

The MHI program also includes six credit hours of elective courses in a related field because students enrolled in the MHI program are expected to have diverse interests in terms of their particular areas of health informatics in which they wish to develop expertise. These interests can range from management of technology in a healthcare setting to applications of artificial intelligence to improving the safety of drug therapy treatments. The program provides this opportunity to further specialize through the elective course mechanism that allows six credits of electives.

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. The course will be designed to accomplish this end by addressing questions about the proper design of such projects, reviewing past exemplar projects and then working with students in conjunction with their advisor to design and carry out their own project. This project can take a variety of forms including: developing design and evaluation specifications for software to address a specific healthcare 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 healthcare setting. Students will submit a written project report in lieu of a final examination. The course grade will be based on the written report and will be determined by agreement among the capstone course instructors and the student’s advisor.

Students may declare a formal minor as defined by another Graduate School program. That coursework may be used to meet the requirements for technical electives or the related field. 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.

Sample Programs of Study

The following sample programs are based on the fact that the HInf and MHA required courses will be offered only once per year. If a student chooses not to take such a course in a given year, they will have to wait until the following year to complete the course. It is recognized that the Fall semester contains a 15 credit load which is one credit above the current tuition band, and represents a significant time commitment for students. However, given the currently availability of required courses, this is one of the few schedules that will allow completion of the program in one calendar year.
Full time student:

Fall Semester
   HINF 5430 – Health Informatics I (4 cr)
   PUBH 6762 - Information Technology in Healthcare (2 cr)
   HINF 5436 – Seminar (1 cr)
   PUBH 6560 - Operations Research and Quality in Health Care (2)
   Technical Elective (3 cr)
   Specialization Elective (3 cr)

Spring Semester
   HINF 5431 – Health Informatics II (4 cr)
   HINF 5436 – Seminar (1 cr)
   PUBH 6414 – Biostatistics (3cr)
   Technical Elective (3 cr)
   Specialization Elective (3 cr)

Summer Semester
   HINF 5xxx - Capstone Project (3 cr)

Part Time Student

Year 1 Fall Semester
   HINF 5430 - Health Informatics I (4 cr)
   PUBH 6762- Information Technology in Healthcare (2 cr)

Year 1 Spring Semester
   HINF 5431– Health Informatics II (4 cr)
   HINF 5436– Seminar (1 cr)

Year 2 Fall Semester
   PUBH 6414 – Biostatistics (3 cr)
   PUBH 6560 - Operations Research and Quality in Health Care (2)

Year 2 Spring Semester
   Technical Elective (3 cr)
   Elective (3cr)

Year 3 Fall Semester
   Technical Elective (3 cr)
   Elective (3cr)

Year 3 Spring Semester
   HINF 5436 – Seminar (1 cr)
   HInf 5xxx - Capstone Project (3cr)
**Administrative Procedures**

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.

<table>
<thead>
<tr>
<th>Action</th>
<th>Form</th>
<th>Action Date</th>
<th>Initiator</th>
<th>Approval</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submit Plan of study</td>
<td>Degree Program Transmittal</td>
<td>By the time 10 credits are completed</td>
<td>S</td>
<td>A, DGS</td>
<td>GS</td>
</tr>
<tr>
<td>Notify Advisor and Capstone course director</td>
<td>Any time after enrollment in the Capstone course</td>
<td>S</td>
<td></td>
<td>CC</td>
<td></td>
</tr>
<tr>
<td>File Grade Capstone Grade Report</td>
<td>After report is approved and a grade is assigned</td>
<td>Capstone Course Director</td>
<td>CD</td>
<td>GS</td>
<td></td>
</tr>
<tr>
<td>File Graduation Forms</td>
<td>Application for Degree form</td>
<td>On or before the first work day of the month in which graduation is desired</td>
<td>S</td>
<td></td>
<td>GS</td>
</tr>
</tbody>
</table>

Legend: S = Student, CC = Capstone Committee (Advisor and course director), CD – Capstone course director, DGS = Director of Graduate Students, GS = Graduate School
MASTER OF SCIENCE DEGREE PLAN A (RESEARCH ORIENTED)

The Plan A program is designed primarily for health professions 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.

**Course Requirements**

<table>
<thead>
<tr>
<th>Course Description</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Informatics: HINF 5430, 5431</td>
<td>8</td>
</tr>
<tr>
<td>Biostatistics: PUBH 6414, 6415</td>
<td>8</td>
</tr>
<tr>
<td>Information Technology in Healthcare: PUBH 6562</td>
<td>2</td>
</tr>
<tr>
<td>Operations Research and Quality in Health Care: PUBH 6560</td>
<td>2</td>
</tr>
<tr>
<td>Seminar: HINF 5436 (two semesters)</td>
<td>2</td>
</tr>
<tr>
<td>Related Field Electives</td>
<td>10</td>
</tr>
<tr>
<td>Master’s Thesis Research</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>42</strong></td>
</tr>
</tbody>
</table>

**Plan of Study and Examining Committee**

Each Master’s student is required to develop a plan of study that lists the courses that have or will be taken to meet the above course requirements. This plan of study should be prepared in conjunction with one’s advisor to insure that all requirements are met and that it represents a coherent and appropriate plan for achieving the student’s objectives.

At the same time, the student is required to submit a list of three graduate faculty members who will serve on his or her doctoral 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. This person cannot be the student’s advisor. This committee also serves in an advisory role during the execution of the Master’s thesis project.

**Research Project**

For the M.S. - Plan A the student is required to prepare and defend a thesis. The student should explore and discuss research topic possibilities with the academic advisor as well as other faculty members, should look beyond their courses, attend seminars and read pertinent journals so that a wise decision as to the thesis topic is possible. A list of appropriate journals and conference proceedings is shown in Appendix E. The proposal should contain the research hypothesis, a statement of significance, background material and a current bibliography, possible methodology to be used or developed, and anticipated results. Specific details regarding proposed format, length, and level of detail should be developed with the student's advisor. 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 Biomedical Library.
**Examination**

A final oral examination is required in defense of the thesis conducted according to the rules established by the Graduate School. The examination 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 outside member is most often from the minor area or area of specialization. The committee members are nominated by the student and their advisor, approved by the DGS and appointed by the Graduate School.

**Graduation Requirements**

In order to graduate from the program with a MS Plan A degree, the student must complete at least 42 credits of coursework with a GPA of at least 3.0 and successfully defend their Master’s thesis. The Graduate School will award students completing these requirements the MS degree.

**Administrative Procedures**

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

<table>
<thead>
<tr>
<th>Action</th>
<th>Form</th>
<th>Action Date</th>
<th>Initiator</th>
<th>Approval</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submit Plan of study, nomination of examination committee and thesis title</td>
<td>Degree Program Transmittal</td>
<td>After 10 credits are completed</td>
<td>S</td>
<td>DGS</td>
<td>GS</td>
</tr>
<tr>
<td>Plan approval and committee appointment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notify committee that the thesis is ready for review</td>
<td></td>
<td>At least 4 weeks prior to defense</td>
<td>S</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Distribute thesis to the committee</td>
<td>Thesis draft</td>
<td>At least 2 weeks prior to defense</td>
<td>S</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Pick up graduation packet from graduate school</td>
<td>Several</td>
<td>At least 2 weeks prior to defense</td>
<td>S</td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>Receive and distribute thesis reviewers report form and distribute to committee</td>
<td>Thesis Reviewer’s Report</td>
<td>At least 2 weeks prior to defense</td>
<td>GS</td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>Set time and place of examination</td>
<td></td>
<td>At least two weeks prior to defense</td>
<td>S</td>
<td></td>
<td>GS</td>
</tr>
<tr>
<td>Exchange Thesis Approval form for final examination form</td>
<td>Final Examination Report form</td>
<td>At least 1 day prior to defense</td>
<td>GS</td>
<td>C</td>
<td>S</td>
</tr>
<tr>
<td>Submit examination results</td>
<td>Signed Final Examination Report form</td>
<td>Last working day of the intended month of graduation</td>
<td>S</td>
<td>C</td>
<td>GS</td>
</tr>
<tr>
<td>File Graduation Forms</td>
<td>Application for Degree form</td>
<td>On or before the first work day of the month in which graduation is desired</td>
<td>S</td>
<td></td>
<td>GS</td>
</tr>
<tr>
<td>Deliver unbound thesis copies Graduate School (2)</td>
<td>unbound and signed thesis</td>
<td>Prior to graduation</td>
<td>S</td>
<td>Advisor</td>
<td>GS Advisor</td>
</tr>
</tbody>
</table>

Legend: S = Student, C = Examination 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 but need additional coursework to become fully qualified.

Course Requirements

<table>
<thead>
<tr>
<th>Course Category</th>
<th>Course Code</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Informatics</td>
<td>HINF 5430, 5431</td>
<td>8</td>
</tr>
<tr>
<td>Biostatistics</td>
<td>PUBH 6414, 6415</td>
<td>8</td>
</tr>
<tr>
<td>Information Technology in Healthcare</td>
<td>PUBH 6562</td>
<td>2</td>
</tr>
<tr>
<td>Operations Research and Quality in Health Care</td>
<td>PUBH 6560</td>
<td>2</td>
</tr>
<tr>
<td>Seminar</td>
<td>HINF 5436 (two semesters)</td>
<td>2</td>
</tr>
<tr>
<td>Related Field Electives</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Technical Electives</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>42</strong></td>
</tr>
</tbody>
</table>

Plan of Study and Examining Committee

Each Master’s student is required to develop a plan of study that lists the courses that have or will be taken to meet the above course requirements. This plan of study should be prepared in conjunction with one’s advisor to insure that all requirements are met and that it represents a coherent and appropriate plan for achieving the student’s 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 doctoral 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. This person cannot be the student’s advisor. This committee also serves in an advisory role during the execution of the doctoral research project.

Research Project

For the M.S. - Plan B program an independent project focused on a health informatics application, culminating a written report must also be completed. 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 from the student's advisor. In general, the advisor is responsible for approving the definition of the project(s), determining relative worth in satisfying the entire requirement and specifying for the student the manner in which evidence of satisfactory completion is to be presented to the examining committee.

Examination

A final oral examination is required. The student is responsible both for the content of the Plan B project(s) and the course work listed on the student's approved program of study. The oral
examination is conducted according to the rules established by the Graduate School. The examination 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 outside member is most often from the minor area or area of specialization. The committee members are nominated by the student and their advisor, approved by the DGS and appointed by the Graduate School.

**Administrative Procedures**

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.

<table>
<thead>
<tr>
<th>Action</th>
<th>Form</th>
<th>Action Date</th>
<th>Initiator</th>
<th>Approval</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submit Plan of study and nominations for the examination committee</td>
<td>Degree Program Transmittal</td>
<td>By the time 10 credits are completed</td>
<td>S</td>
<td>DGS</td>
<td>GS</td>
</tr>
<tr>
<td>Plan approval and committee appointment</td>
<td></td>
<td></td>
<td>GS</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Notify committee that the project is ready for review</td>
<td></td>
<td>At least 4 weeks prior to defense</td>
<td>S</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Distribute project report to the committee</td>
<td>Draft report</td>
<td>At least 2 weeks prior to defense</td>
<td>S</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Set time and place of examination</td>
<td></td>
<td>At least two weeks prior to defense</td>
<td>S</td>
<td>GS</td>
<td>GS</td>
</tr>
<tr>
<td>Obtain the examination report form as part of the graduation packet</td>
<td>Final Examination Report form</td>
<td>At least 1 day prior to defense</td>
<td>GS</td>
<td>C</td>
<td>S</td>
</tr>
<tr>
<td>Submit examination results</td>
<td>Signed Final Examination Report form</td>
<td>Last working day of the intended month of graduation</td>
<td>S</td>
<td>C</td>
<td>GS</td>
</tr>
<tr>
<td>File Graduation Forms that are part of the graduation packet</td>
<td>Application for Degree form</td>
<td>On or before the first work day of the month in which graduation is desired</td>
<td>S</td>
<td>GS</td>
<td>GS</td>
</tr>
</tbody>
</table>

Legend: S = Student, C = Examination Committee, DGS = Director of Graduate Studies, GS = Graduate School

**Graduation Requirements**

In order to graduate from the program the student 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 students completing these requirements the M.S. degree.
Doctor of Philosophy (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 in which the coursework is ultimately applied 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 after completing most or all of the required Ph.D. coursework, the student should sit for the Written Preliminary Examination, and if successfully completed, then take the Oral Preliminary Examination. The suitability of timing should be determined by the student in consultation with the advisor. 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.

Course Requirements

It is expected that the Ph.D. student 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.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Informatics: HINF 5430, 5431</td>
<td>8 credits</td>
</tr>
<tr>
<td>Biostatistics: PUBH 6450, 6451</td>
<td>8 credits</td>
</tr>
<tr>
<td>Information Technology in Healthcare: PUBH 6562</td>
<td>2 credits</td>
</tr>
<tr>
<td>Operations Research and Quality in Health Care: PUBH 6560</td>
<td>2 credits</td>
</tr>
<tr>
<td>Seminar: HINF 5436 (two semesters)</td>
<td>2 credits</td>
</tr>
<tr>
<td>Electives (including a related field or Minor)</td>
<td>26 Credits</td>
</tr>
<tr>
<td>Doctoral Thesis Research</td>
<td>24 Credits</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>70 Credits</strong></td>
</tr>
</tbody>
</table>

At least 16 of the elective credits must be advanced graduate courses (other than the introduction to an area or at least the second course in a sequence) as approved by your graduate committee. In addition, at least 12 of the 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 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 above course requirements. This plan of study should be prepared in conjunction with one’s advisor to insure that all requirements are met and that it represents a coherent and appropriate plan for achieving the student’s objectives.
At the same time, the student is required to submit a list of 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. This person cannot be the student’s advisor.

**Written Preliminary Examination (WPE)**

Students who are considering admission to the Ph.D. program in Health Informatics should discuss this with their advisor. One of the requirements for admission to Ph.D. candidacy is passing the Written Preliminary Examination (WPE) in Health Informatics. Students who take the WPE and fail it can redo it one additional time. It can be done no more than twice.

**Eligibility:** ALL second year and further students in the HI graduate program who have demonstrated the ability to do outstanding work at the graduate level in this program by obtaining grade point averages >3.5 in first-year core courses are offered the opportunity to take this examination. All incomplete or missing grades for first-year core courses must be complete and available to the WPE committee through transcript or miscellaneous grade report. If you were excused from some of the first year core courses, your qualifying GPA will be based only on the first year core courses that you did complete. Those students that 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, their grades in these courses, and give the list to Doreen Gruebele, HI Graduate Program secretary (612-625-8440, Mayo 777) when they turn in the WPE proposal (see below).

Also, the student must discuss the formation of an Oral Preliminary Examination (OPE) Committee with their advisor, and make a recommendation for members of this committee to the DGS a minimum of one month prior to submission of the WPE proposal. The DGS will appoint the OPE committee.

**WPE Structure and Content:** The WPE will consist of an original research proposal. This proposal should provide an original hypothesis about a problem in the field of health informatics; 2) provide a critical review of relevant literature leading to the stated hypothesis; 3) include a statement regarding the significance of the problem; 4) provide a process or procedures for data collection to test this hypothesis; and 5) include 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 type 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 WPE. Since this is an examination, the proposal must be of the student's own creation. The student may not use any research grant application written by his/her advisor in preparing the proposal. It is up to the student 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 be sufficiently narrow that it represents a 3-4 year project that can be completed by an individual, not a broad NIH grant to support 5-10 people. The student is encouraged to consult with members of the examining committee in developing ideas. However, the student should not let anyone read her/his proposal prior to submission to the DGS.

Grading The WPE 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 Oral Preliminary Examination Committee, excluding the advisor, and one faculty member chosen by the WPE Committee. This committee will review the WPE and assign it one of three outcomes: Each student will eligible for two rounds of evaluation for their WPE. A student will only proceed to the second round if the result of the first round of evaluation is a grade of Unacceptable. One of the following grades will be assigned to each attempt:

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

The grading outcomes are as follows:

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

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

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

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

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

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

Round 2, grade is Acceptable with revisions: The student must revise the WPE according to the directions of the committee and submit the revised WPE 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 WPE.

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

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

**The WPE Process:** The process of completing the WPE is as follows:

1. Submit an "Intent to take the WPE" letter 30 days before submission of the WPE to the DGS that lists:
   a. Your name
   b. A copy of your Plan of Study and Examination Committee Appointment forms.
   c. The title and a brief abstract of the intended WPE
2. Submit the completed WPE 30 days after the submission date of the "Intent to take the WPE" letter.
3. The student's WPE committee will grade the examination within 30 days of its submission date according to the grading scheme above.
4. If the final outcome is **Acceptable** the student's advisor will prepare the Written Preliminary Examination Report form and submit it to the DGS who will forward it to the Graduate School.
5. If the final outcome is **Unacceptable**, the student’s academic record and WPE performance will be submitted for review by Graduate Faculty and the student is subject to dismissal from the program.

**Oral Preliminary Examination (OPE)**

Once the student successfully completes the WPE with a grade of Acceptable, he or she is eligible to take the Oral Preliminary Examination. In the OPE the student presents their thesis proposal based on the written preliminary examination to their Examination 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 OPE committee concerning the proposal. The OPE is a private session with only the student and the OPE committee present. The committee for the examination consists of at least four members, one from a field other than the major.

After notification from the DGS that the WPE has been passed, the student will schedule the OPE. In the OPE the student presents their thesis proposal based on the written preliminary examination to their Examination 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 OPE committee concerning the proposal. The OPE is a private session with only the student and the OPE committee present.
The committee for the examination consists of at least four members, one from a field other than the major. The OPE will start with a defense of the WPE proposal. If the WPE proposal is unrelated to the thesis proposal, the OPE must also include a defense of the thesis proposal. However, the examination is intended to be open-ended and may range into other areas. In particular, members of the examining committee representing the minor or supporting program should evaluate the student for his/her breadth of knowledge.

The student must schedule her/his Oral Preliminary Examination for a date within a period of a year and inform the DGS of this date. It is up to the student in consultation with the committee members to find a suitable date for the examination and to reserve a room through the HI 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 OPE, the student needs to file the Doctoral Preliminary Oral Examination Scheduling form with the Graduate School. If the OPE is not schedule within one year from date of passing the WPE, the student's advisor must request an extension from the DGS.

The following steps are required:

1. The student should distribute the WPE to his or her advisor and any other members of the OPE committee who have not participated in the grading of the WPE.
2. The student will consult with members of the OPE committee to schedule a two hour time block during which ALL members can be present.
3. Notify the Graduate School of the date of the OPE at least one week prior to the scheduled date.
5. The result of the OPE is one of the following:
   - *Pass* - the student passes the OPE and is admitted to candidacy for the PhD.
   - *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 OPE.
   - *Recess of the OPE* - The committee may elect to recess the OPE 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 examination 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. It is beyond the scope of this handbook to attempt a comprehensive description of thesis efforts. 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/gs16.pdf](http://www.grad.umn.edu/current_students/forms/gs16.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 the 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 committee for the final oral examination is the student’s appointed Examination Committee. Although the student's advisor is a member of this committee, it is chaired by another full member of the graduate faculty. In addition, committee membership is determined on the basis of the thesis and may differ from the membership of the preliminary oral examination committee. The three thesis reviewers (2-major, 1-supporting or minor) are members of this committee. In the case of a designated minor, the non-Health Informatics member must be from the minor.

The following is a summary of the thesis defense process:

1. The Graduate School will appoint the Final Oral Examination 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 required Graduate School copies ready for binding 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.

<table>
<thead>
<tr>
<th>Action</th>
<th>Form</th>
<th>Action Date</th>
<th>Initiator</th>
<th>Approval</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submit Plan of study, nomination of preliminary oral examination committee</td>
<td>Degree Program Transmittal</td>
<td>One semester before the OPE</td>
<td>S</td>
<td>DGS</td>
<td>GS</td>
</tr>
<tr>
<td>Submit the “Intent to take the WPE” form</td>
<td>Program form</td>
<td>As student and advisor’s discretion</td>
<td>S</td>
<td>A</td>
<td>DGS</td>
</tr>
<tr>
<td>Submit the WPE</td>
<td></td>
<td>30 days after Intent form is filed</td>
<td>S</td>
<td></td>
<td>DGS</td>
</tr>
<tr>
<td>Submit the WPE report form</td>
<td>Preliminary Written Examination Report form</td>
<td>When final grade of WPE is determined but at least one week before the OPE</td>
<td>DGS</td>
<td></td>
<td>GS</td>
</tr>
<tr>
<td>Schedule the Preliminary Oral Examination with the Graduate School</td>
<td>Doctoral Preliminary Oral Examination Scheduling</td>
<td>Within 12 months of WPE submission but not less than one week before the exam Must be at least one academic term (15 weeks) before the Final Oral Defense.</td>
<td>S</td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>Submit the OPE examination report form</td>
<td>OPE Report form</td>
<td>Within one working day of OPE.</td>
<td>C</td>
<td></td>
<td>GS</td>
</tr>
<tr>
<td>File thesis proposal form</td>
<td>Thesis Proposal form</td>
<td>No later than the first semester after the OPE is passed</td>
<td>S</td>
<td></td>
<td>GS</td>
</tr>
<tr>
<td>Request graduation packet from the graduate school</td>
<td>Several including the Thesis Reviewer’s Form</td>
<td>After the Thesis Proposal form has been approved</td>
<td>S</td>
<td></td>
<td>S</td>
</tr>
<tr>
<td>Notify committee that the thesis is ready for review</td>
<td></td>
<td>At least 4 weeks prior to defense</td>
<td>S</td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>Distribute thesis to the committee</td>
<td>Thesis draft</td>
<td>At least 3 weeks prior to defense</td>
<td>S</td>
<td></td>
<td>C</td>
</tr>
<tr>
<td>Submit Thesis Reviewer’s form and set time and place of the examination</td>
<td>Thesis Reviewer’s Form</td>
<td>At least one week prior to the defense</td>
<td>S</td>
<td></td>
<td>GS</td>
</tr>
<tr>
<td>Submit examination results</td>
<td>Signed Final Oral Examination Report form</td>
<td>Within one working day of completion of the oral defense</td>
<td>C</td>
<td></td>
<td>GS</td>
</tr>
<tr>
<td>Action</td>
<td>Form</td>
<td>Action Date</td>
<td>Initiator</td>
<td>Approval</td>
<td>Destination</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>-------------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>-----------</td>
<td>---------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>File Graduation Forms</td>
<td>Application for Degree form</td>
<td>On or before the first work day of the month in which graduation is desired</td>
<td>S</td>
<td></td>
<td>GS</td>
</tr>
<tr>
<td>Deliver a thesis copy to Graduate School</td>
<td>signed thesis</td>
<td>Last working day of the intended month of graduation</td>
<td>S</td>
<td>Advisor</td>
<td>GS Advisor Program</td>
</tr>
</tbody>
</table>

Legend: S = Student, C = Examination Committee, DGS = Director of Graduate Students, GS = Graduate School.
APPENDIX A – MHI and MS Plan B Project Cover Page

Sample Format for Cover Page of Plan B Project Paper

(Title)

A PLAN B PAPER or AN MHI PAPER
(chose one of the above)
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 or MASTER OF
SCIENCE (Choose one)

(Date)