Graduate Program in Health Informatics Student Handbook For:

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

Institute for Health Informatics
Academic Health Center
University of Minnesota

Fall 2021

Director of Graduate Studies
David Pieczkiewicz, Ph.D.
(612) 626-8591
piecz@umn.edu

Academic Programs Manager
(Graduate Program Coordinator)
Jenna Lohnes
(612) 625-1558
lohne002@umn.edu

Office and Package Location:
8-100 Phillips-Wangensteen Building
516 Delaware St. SE
Minneapolis, MN 55455

Mailing Address:
420 Delaware St. S.E.
MMC 912
Minneapolis, MN 55455

Table of Contents

General Information....3
Organization....3
Space....3
People and Organization....3
Director of Graduate Studies (DGS)....3
Graduate Faculty....4
Staff....4
University of Minnesota Resources and Information....5
Expectations....6
Conduct....6
Health Informatics Student Conduct Code....6
Board of Regents Student Conduct Code....6
Classroom Conduct Procedures and Policy....6
Student General Rights of Appeal of Academic Misconduct....6
Progress....6
Maintaining active student status....7
Annual Progress Review....7
Style Guide....8
Degree Requirements....9
Master of Health Informatics (MHI)....9
Advising....9
Required courses for the MHI....10
Graduate Planning & Audit System (GPAS)....11
Graduation Packet....11
Capstone Project....11
MD/MHI Combined Degree Program....13
PharmD/MHI Combined Degree Program....13
Master of Science (MS)....14
Advising....14
Required Courses for the MS....14

Graduate Planning & Audit System (GPAS)....15
MS Committees....16
Plan A Thesis....16
Plan B Project....17
Doctor of Philosophy (PhD)....18
PhD Tracks....18
Advising....22
Graduate Planning & Audit System (GPAS)....23
Preliminary Oral Report....23
Graduation Packet....23
Preliminary Exam Process....24
Research and Dissertation....26
Final Exam Process....28
Appendices....31
Appendix A: Code of Conduct for Graduate Students in Health Informatics....31
Appendix B: HINF Courses....33
Appendix C: Capstone Cover Page....35
Appendix D Plan B Cover Page....36

The information in this handbook and other university catalogs, publications, or announcements is subject to change without notice. University offices can provide current information about possible changes.

The University of Minnesota shall provide equal access to and opportunity in its programs, facilities, and employment without regard to race, color, creed, religion, national origin, gender, age, marital status, disability, public assistance status, veteran status, sexual orientation, gender identity, or gender expression.

General Information

This handbook includes important and official information about the Institute for Health Informatics' graduate program in Health Informatics. The information found in this guide is specific to the Health Informatics program and is intended as a resource for new and existing students. The handbook is the primary source of information about the rules and regulations concerning the program, and it outlines general Graduate School requirements. Further details about the Graduate School's rules and procedures are on the Graduate School's website, www.grad.umn.edu. Your advisor, the Director of Graduate Studies (DGS), IHI staff and faculty, the Graduate Education Catalog (https://catalogs.umn.edu/), the IHI website (www.healthinformatics.umn.edu), and the University's policy library (www.policy.umn.edu) are all excellent resources for other questions you may have.

Organization

The Health Informatics (HINF) graduate program is housed within the Institute for Health Informatics (IHI). The terms "Health Informatics graduate program" (sometimes just "graduate program") and "IHI" may be used interchangeably. However, strictly speaking, the graduate program refers to the actual degree-granting program. The IHI refers to the administrative entity or "department" that supports the graduate program and the location of that entity. HINF is also used as the course designator (e.g. HINF 5430 is the course number for Health Informatics I). The IHI is part of the Health Sciences (AHS) and the Graduate School.

What is my…

Degree- MHI, MS, or PhD
Major- Health Informatics
Program/Graduate Program- Health Informatics (HINF) graduate program
Department- Institute for Health Informatics
College- Graduate School (08GRD)
Track (PhD only)- Clinical Informatics, Data Science and Informatics for Learning Health Systems, Translational Bioinformatics, or Precision and Personalized Medicine Informatics

Space

The IHI, located in Suite 8-100 Phillips-Wangensteen Building, is open from 7:30am-5:30pm Monday through Friday.

People and Organization

The program has a diverse faculty drawn from multiple departments and divisions throughout the University of Minnesota. The Director of Graduate Studies (DGS) is responsible for the ongoing operation of the program. The DGS reports to the IHI Director for all academic matters. The Academic Health Sciences oversees the graduate program. The Graduate School and the Graduate Student Services and Progress (GSSP) provide support and assistance with admissions, student progress, and the granting of degrees.

Director of Graduate Studies (DGS)

The DGS is appointed by AHS-Shared after consultation with the IHI Director and Health Informatics graduate faculty. The DGS acts as or assigns an initial advisor to most students at program entry, reviews, approves, and signs required forms, and designates the Preliminary Written Examination (PWE) reviewers for PhD students. Students seeking advice about the program or experiencing any procedural difficulties should contact the DGS.

Graduate Faculty

Faculty members in the IHI serve in at least one of the following ways: advising, student committee membership, teaching, providing internship or project experiences, research, and service. There are several types of faculty associated with the Institute for Health Informatics and the Health Informatics graduate program. However, students only need to understand the following distinctions and classifications:

1. Only "Graduate Faculty" may advise or serve on student committees.
2. Almost all "IHI Core Faculty" are "Graduate Faculty".
3. Many, but not all, "Affiliate Faculty" are "Graduate Faculty".

For a complete list of Health Informatics Graduate Faculty and roles they may take, see the Graduate Education Faculty Role List, https://apps.grad.umn.edu/programs/faculty.aspx. For all Core and Affiliate Faculty bios, see the faculty page of the IHI website, healthinformatics.umn.edu/about/faculty-staff.

Staff

The IHI support staff members answer questions and assist current and prospective students. They are often the first points of contact, and they are quite knowledgeable concerning both program and university rules and procedures. The Academic Programs Manager, also known as the Graduate Program Coordinator (GPC), works closely with the graduate program, and is a resource for students during every step in their academic careers. The staff also provide support for the work of the DGS and the graduate faculty and are able to schedule meetings for students.

The MHI and MS degree programs are currently in candidacy status, pending accreditation review by the Commission on Accreditation for Health Informatics and Information Management Education (CAHIIM).

University of Minnesota Resources and Information

OneStop
https://onestop.umn.edu/

- Financial Aid, Student Finance, Registration, Student Records, Degree Planning
- Academic Calendar: https://onestop.umn.edu/dates-and-deadlines

Boynton Health Services
https://boynton.umn.edu/

- Provides healthcare resources to UMN campuses including primary clinic, dental clinic, quick clinic pharmacy, etc.
- Offers additional health resources with weekly exercise courses, discounted bicycle merchandise, immunizations, etc.

Office of Information Technology
https://it.umn.edu/students

- Provides discounted hardware and software.
- Offers technology assistance over the phone and at various locations including Coffman Union.

International Student & Scholar Services (ISSS)
www.isss.umn.edu

- Assists international students and scholars in successfully accomplishing the goals that brought them to the University, by using all available resources (i.e. visa forms, other documentation, etc.)
- Programs and resources to help international students meet each other, support each other, and acclimate to Minnesota.

Coffman Union/Student Union and Activities
http://sua.umn.edu/locations/coffman/

- Information Desk, Marketplace, Goldy's Gameroom, The Whole Music Club
- Postal station and TCF Bank
- Hennepin County Service Center
- Deals and discounts on local activities
- Bookstore (textbooks, hardware, software, apparel, accessories, etc.)

Tuition and Fees
https://onestop.umn.edu/finances/billing-and-payment

- Student accounts can be paid online, in-person, by drop box, or by mail.
- If tuition and fees are not paid by the due date, a late fee will be charged and a hold will be placed on your record.
- You have the option of enrolling in a payment plan if you would like to your tuition in installments.
- If you have concerns regarding charges, tuition, etc. it is best to bring these to OneStop and IHI administration's attention immediately.

Expectations

Conduct

Health informatics professionals and professionals-in-training are held to high academic, ethical, and professional standards since they frequently deal with confidential information pertaining to human health.

Health Informatics Student Conduct Code

All students enrolled in the Health Informatics graduate program must adhere to and comply with the Student Conduct Code, Appendix A. All students must sign and date this document indicating that they have read, understood, and agree to it, including the consequences that may follow from behavior that does not fulfill the responsibilities listed. Students submit the signed code of conduct to the program staff prior to their first graduate class. Students who refuse to sign and submit the document in a timely manner are subject to having their admission to the program revoked.

Board of Regents Student Conduct Code

Health Informatics students must also adhere to and comply with the University of Minnesota Board of Regents Student Conduct Code http://regents.umn.edu/sites/default/files/policies/Student_Conduct_Code.pdf. This is enforced by the Office of Student Conduct and Academic Integrity (OSCAI), www.oscai.umn.edu/ and the Campus Committee on Student Behavior (CCSB). When a student violates or allegedly violates the Student Conduct Code, the Health Informatics graduate program will report the student to OSCAI. The IHI will defer to their processes for dealing with all such incidents. For more information see, http://oscai.umn.edu/address-misconduct/responding-scholastic-dishonesty and the Resolving Alleged Student Conduct Code Violations administrative policy and procedure.

Classroom Conduct Procedures and Policy

In addition to the rights of safety and respect protected by the conduct codes, all students at the University have the right to a calm, productive, and stimulating learning environment. In turn, instructors have a responsibility to nurture and maintain that environment. Lively, even heated, discussion is not disruptive behavior. However, student behavior that is an obstacle to teaching and learning must be addressed. In the event that student behavior is disruptive to the classroom environment, the instructor will follow the process outlined in the Institute for Health Informatics Conduct and Conflict Procedures.

Student General Rights of Appeal of Academic Misconduct

Students desiring to appeal a decision of the Health Informatics graduate program related to violations of either of the codes of conduct may do so by preparing a letter of appeal and submitting it to the DGS. The letter should state the specific reasons that 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, the student may then appeal this decision to the Graduate School of the University of Minnesota. Students should contact the Student Conflict Resolution Center (http://www.sos.umn.edu/) for assistance with appeals and grievances. For more information about the appeal process, see https://policy.umn.edu/education/studentcomplaints-proc02

Progress

We expect all students to make steady and consistent progress toward their degrees and to maintain a satisfactory GPA (2.8 for MHI students, 3.0 for MS and PhD students). The program faculty evaluate "steady and consistent progress" based on the apparent ability to complete the program within the required number of years. Students who are unable to complete the program within this timeframe

may petition the program for an extension of up to 12 months. The program reserves the right to terminate students who fail to complete the program within the required time limits.

Maintaining active student status

All students are required to register every fall and spring semester in order to maintain active status in the program. Students do not need to register in the summer. If students do not register in a given semester, the Graduate School will automatically deactivate them from the program in that semester. Anyone who is deactivated in this way will have to reapply in order to continue the program. We do recognize that there are exceptional circumstances that may interrupt degree progress. Students who are not able to maintain active status are strongly encouraged to consult with the DGS, their advisor(s), and relevant offices to determine the appropriate course of action.

GRAD 999 and FTE Registration

Students with DGS approval may register for GRAD 999 in order to maintain active status without registering for any courses. GRAD 999 does not satisfy the requirements for international students, TAs, RAs, and others who must be enrolled full-time. Students may need to enroll in full-time equivalency (FTE) credits in order to meet these requirements. TAs and RAs should contact the Graduate Assistant and Student Employment Programs Office, gaesinfo@umn.edu, and international students should contact the International Student and Scholar Services (ISSS) office, www.isss.umn.edu, for more information.

There are limits to the number of times students may register for GRAD 999, so please plan accordingly. The program may grant exceptions to this policy when circumstances warrant; however, if you plan to be gone for several semesters, a leave of absence may be a better choice.

Leave of Absence and Withdrawal

Students with advisor, DGS, *and college* approval may request a leave of absence for up to two academic years. Students must complete a Leave of Absence Request form that specifies the term(s) and year(s) of the leave. To return they must complete a Leave of Absence Reinstatement Request form and enroll in classes no later than the term immediately following the expiration of the leave (excluding summer). The college may specify reasonable conditions for reinstatement to active status, whether the student returns early or at the expiration of the leave. They may also deny reinstatement if the student engages in crimes or other serious misconduct during the leave that would have been grounds for suspension or expulsion had the student been active. Students also have the option to withdraw from the program if an LOA is not sufficient for the student's needs. This should be discussed with students advisor and the DGS. For information regarding withdrawing from the program, visit OneStop's website, https://onestop.umn.edu/academics/withdraw-university
For the complete policy and links to the forms, please search for leave of absence in the university's policy library, www.policy.umn.edu.

Express Readmit

Students who do not enroll in a given fall or spring semester, and are therefore deactivated and removed from the program, may be eligible for an Express Readmit if they have DGS approval. This option is only available for applicants returning to the exact same major program to pursue the exact same degree. There is a $75 fee for the Express Readmit, but this is generally waived for applicants who were registered for the previous term but neglected to register in the current term. See the Grad School Admissions website, www.grad.umn.edu/admissions, for more information and for the link to the Express Readmit Application.

Annual Progress Review

Every May, students will receive a link to an online self-evaluation and goals system. After they complete the evaluation, advisors will provide additional comments. A faculty committee then reviews each student's evaluation, student record, and academic progress to determine if that progress is

acceptable and meets the program's criteria. Students will receive a letter describing their progress and any concerns the faculty have. If students are not making adequate progress or are not maintaining the required GPA, they may be placed on academic probation. The progress letter will outline reasons for probation, necessary steps to be taken off probation, and consequences of not completing the steps (usually dismissal from the program). Students who have been taken off probation are subject to dismissal without probation if they stop making progress or their GPA falls below the minimum again. Students should discuss the contents of their progress letter with their advisors and the DGS.

Appealing Annual Progress Letters

Students wishing to appeal an academic probation or dismissal decision in an academic progress letter 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, the student may then appeal this decision to the Graduate School of the University of Minnesota. Students should contact the Student Conflict Resolution Center (http://www.sos.umn.edu/) for assistance with appeals and grievances.

Style Guide

All students should write their projects (Capstone, Plan B, MS thesis, PWE, and PhD thesis) in accordance with the sixth edition of the American Psychological Association (APA) manual. All in-text and bibliographic citations should be written in Vancouver style in order to reflect the American Medical Informatics Association's (AMIA) requirements. There is a copy of the APA manual on the second floor in the reference section of the biomedical library. Students may not check out this copy, but may use it in library. The Vancouver citation guide is called *Citing Medicine*. The full text of the current edition is online at http://www.ncbi.nlm.nih.gov/books/NBK7256.

Other online style resources:
http://www.apastyle.org
https://owl.english.purdue.edu/owl/resource/560/01
http://www.icmje.org/icmje-recommendations.pdf

Degree Requirements

Master of Health Informatics (MHI)

The MHI is a 31-credit professional degree that may be completed in as little as one calendar year or up to five years. Be aware that we only recommend the one-year option to highly motivated students who can handle a 15-16 (more than full time) credit course load each semester or who have many transfer credits. Most full-time students will require at least three full semesters. The MHI is intended for working professionals and others who would like training in understanding, implementing, evaluating, and applying the many information technologies becoming more prevalent in the health care industry.

The MHI program trains students in the following competencies:

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

Advising

In order to ensure that all MHI students have the best possible educational experience, we have developed a dual-advisor policy to create a personal, professional advising system that meets the needs of each of our students. The Director of Graduate Studies (DGS), with the help of IHI staff, will provide academic advising concerning coursework and related matters. This is why in most cases, the DGS appears as your advisor when you first enroll in the program. Academic advisors provide advice to all students in selecting coursework that meets their degree requirements, and they provide assistance in developing a course plan that meets students' academic goals. This academic advising will be in consultation with the student's degree project advisor to the extent necessary and desired.

The capstone course director, Terry Adam, serves as the initial degree project advisor for all MHI students. Other HINF graduate faculty members may advise the capstone project if the designated faculty member selected by the student agrees to take on the responsibility and the DGS and capstone course director approve the change. In order to advise alone, the selected faculty member must have previously advised an MHI capstone project. If this is not the case, the capstone course director will act as a mentor to the advisor. The capstone course director has the right to contact HINF faculty members in order to encourage them to work with specific MHI students.

Required courses for the MHI

Course	Credit(s)	Semesters offered	Notes
Health Informatics I HINF 5430	3	Fall Spring	
Health Informatics II HINF 5431	3	Spring	
AHC Informatics Grand Rounds HINF 5436	1	Fall	
Applied Health Care Databases HINF 5510	3	Fall	
Clinical Informatics and Patient Safety HINF 5520	2	Spring	
Health Care Analytics and Data Science HINF 5531	3	Spring	
Capstone Project HINF 5499	3	Fall Spring Summer	
Population Heath Informatics NURS 7108	2	Fall	Contact the School of Nursing for more information
Biostatistics I PUBH 6450	4	Fall Spring	Contact the School of Public Health for a permission number
Electives	7		
TOTAL	31		

In addition to the required courses, the program includes 7 elective credits. We encourage students to fulfill these elective credits by taking courses that correspond to their interests, whether they be in statistics, epidemiology, health services research, computer science, biomedical engineering, decision science courses, or another related field. Students may use their elective courses to declare a formal minor. If students choose to undertake a formal minor, they must meet all of the requirements of the program offering the minor.

Transferred and Waived Courses

MHI students must complete 20 credits as a student in the MHI program. The other 11 credits may be transferred from another UMN program, non-degree status, or a regionally accredited university. All transfer credits must meet the program requirements and be approved by the advisor and the DGS.

Students are not able to use undergraduate credits used to satisfy their major requirements as transfer credits in their graduate degree. Students can work with their undergraduate advisor to find courses taken as an undergraduate, but not used to satisfy their major, to transfer in. This must be approved by their graduate advisor, as well as their undergraduate advisor.
https://onestop.d.umn.edu/sites/onestop.umn.edu/files/forms/otr028_transfer_credits_undergraduate_to_graduate.pdf

Students in the dual degree program (Pharm/MHI) must fill out a OneStop form to transfer credits from their PHAR career to the MHI and get it signed by their advisor. https://onestop.umn.edu/sites/onestop.umn.edu/files/forms/otr029_transfer_credits_between_graduate_and_professional.pdf

Students also have the option of waiving required courses if they have taken other courses that meet program requirements. The DGS must approve waivers. Students who have courses waived will have to take an equal number of elective credits in order to earn a total of 31 credits in the program.

Graduate Planning & Audit System (GPAS)

Students use GPAS to plan the courses they are going to take and to see how the courses they have taken fulfill the program requirements. A GPAS report must be submitted and approved before students are able to access the graduation packet.

Students must have all transferred/waived coursework entered into their GPAS before submission. Please contact the GPC before you begin working on your GPAS if you have transfer/waived credits.

We reserve the right to put a hold on the record of any students who have not submitted a GPAS report in the semester before they plan to graduate. This is because students cannot request a gradation packet until the Graduate School has processed their courses. Please plan accordingly.

Graduation Packet

The online graduation packet contains a workflow for the Application for Degree and a pdf of the Final Report. Students must request the graduation packet online at https://onestop.umn.edu/academics/graduation-checklist-grad-students. Forgetting about the graduation packet is the *most common mistake* students make. It can have a *profound impact* on when they are able to graduate. Keep the following in mind:

1. MHI students cannot request a grad packet until the Graduate School has processed their GPAS.
2. Only students who have requested the grad packet may participate in commencement.
3. The Application for Degree is due on the first day of the intended month of graduation.
4. The Final Report is due on the last day of the month of graduation. The DGS will not sign the form until all grades are entered, including the capstone grade. Keep your expected graduation month in mind when determining a capstone project due date with your project advisor.
5. Students will not be penalized for submitting their forms early. If circumstances change so that they are not able to graduate in the intended month, students should email GSSP@umn.edu to request a new month.

Capstone Project

The capstone project is *not* a thesis, but rather it is an independent culmination of degree work. The three-credit capstone experience allows students to have a final opportunity to apply their newly acquired knowledge and skills to a project involving a practical problem in health informatics. Students will learn how to design these projects properly, reviewing past exemplary projects as guides. Then, with the help of their degree project advisor or informal mentor and the capstone course director, students will design and carry out their own projects. These 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. Internship experiences or a systematic review of topical literature also constitute suitable

capstone projects. Students will submit a written project report in lieu of a final examination. The capstone project coordinator and the student's project mentor will assign a grade to the report. In cases where a formal degree project advisor other than the capstone project coordinator has been designated, that person will assign the grade.

The MHI capstone is self-selected to fulfill one or more competencies of the MHI Program (see page 9). MHI students normally will register for HINF 5499, 3 credits, during their last semester when essentially all of the coursework listed on the GPAS report is complete. Students then meet with the capstone course director to develop and initiate their capstone projects. The course director and grader for the Capstone is Terry Adam. Please direct all questions regarding the project to Terry (adamx004). You will also want to coordinate your graduation timeline with him to ensure that your Capstone grade is in on time for you to graduate.

The Capstone process involves:

1. Identifying a site, a project goal, and a degree project advisor or informal mentor in that setting who will supervise the student's work. While it is encouraged, a mentor does not need to have any formal affiliation with the IHI or the HINF Graduate Faculty.
2. Fulfilling any data or site-specific regulatory requirements, e.g. Institutional Review Board (IRB, University of Minnesota ***plus*** User Site), Health Insurance Portability and Accountability Act (HIPAA), and/or user-system training.
3. Submitting, for approval by the degree capstone course director and project advisor or mentor, a 1-2 page capstone project proposal indicating:
    a. Title
    b. Short problem description
    c. Brief listing of related work by others, as a bibliography
    d. A project plan consisting of a bulleted list of activities and a timeline for completion with one or more intermediate milestone(s).

The entire capstone project should take no more than 100 hours of project work, plus 20 hours to compose and write the report, estimated at 15-30 numbered pages. The capstone report should be prepared according to the guidelines below. It also must include a cover page with your name, project title, date, HINF/MHI program, and signatures of the capstone course director and degree project advisor or mentor. (See Appendix C for the cover page template.)

1. Use scientific report format (may include):
    a. Abstract
    b. Problem statement
    c. Rationale and framework of solutions
    d. Background and review of literature
    e. Methods and models
    f. Results and evaluation
    g. Discussion
    h. Conclusion and next steps
    i. Acknowledgements
    j. Bibliography using the style found in *Citing Medicine: The NLM Style Guide for Authors, Editors, and Publishers [Internet]. 2nd edition* found at http://www.ncbi.nlm.nih.gov/books/NBK7256.
    k. Appendices, as needed for documentation
2. A separate one-page reflective assessment of the project should be submitted with the report, discussing these questions:
    a. What MHI competencies were addressed with the capstone project?
    b. How were capstone objectives achieved; how did you know?
    c. What informatics skills and qualifications were practiced?
    d. What informatics contributions does the capstone demonstrate?
    e. How does this work fit with your selected course plan?

f. What career goal is anticipated in the future?

MD/MHI Combined Degree Program

Current University of Minnesota medical students are able to take a year off from their medical studies to earn an MHI. The MD/MHI is an accelerated program that takes one full calendar year. Students may complete the MHI in the fall and spring semesters following either their second or third year of medical school. The schedule of required courses is the same as the MHI full-time course of study except that three credits of Medical Informatics (LAMP 7195) replaces the MHI Capstone. This must be taken during the clerkship years (the last two years of medical education).

Enrollment and registration
The University only allows students to be enrolled in one school at a time, so while students are pursuing the MHI they will be enrolled in the graduate program and not in the MD program. As such, they will be subject to the Graduate School's tuition rates and fees.

Students must register for a full-time course load each semester in order to remain in the program. If a student is unable to complete one or more of the courses within the required semester, he or she will be given an incomplete grade and will be required to complete the coursework before taking LAMP 7195.

PharmD/MHI Combined Degree Program

The PharmD/MHI program allows for students to receive both degrees within four years. Students can look at the Study Plan to help guide them on registering for courses in both programs. This plan is a guide, students to not need to follow it exactly. Note that students can transfer up to 12 credits of pharmacy courses as part of the dual degree. Pharmacy students will transfer credits from required PHAR coursework to cover the MHI elective requirement of 6 credits. No additional electives are needed. Students will work with both their Pharmacy advisor and Informatics advisor to ensure they are making good progress and know next steps for completing the degree.

Enrollment and registration
The University only allows students to be enrolled in one school at a time, so while students are pursuing the MHI they will be enrolled in the graduate program and not in the PharmD program. As such, they will be subject to the Graduate School's tuition rates and fees.

Master of Science (MS)

The MS is a 36-credit degree that may be completed in as little as two years or up to five years. The MS is intended for students who are interested in research, but who do not have the background or are not ready to commit to the PhD program.

There are two kinds of MS degrees: MS Plan A and MS Plan B. The Plan A culminates in a substantial, 10-credit master's thesis. The Plan B culminates in a smaller, 4-credit Plan B project. Electives comprise the additional 10 credits in the Plan B degree.

Advising

In order to ensure that all MS students have the best possible educational experience, we have developed a dual-advisor policy to create a personal, professional advising system that meets the needs of each of our students. The Director of Graduate Studies (DGS), with the help of IHI staff, will provide initial academic advising concerning coursework and related matters. This is why the DGS appears as your advisor when you first enroll in the program. Academic advisors provide advice to all students in selecting coursework that meets their degree requirements, and they provide assistance in developing a course plan that meets students' academic goals.

A graduate faculty member will advise the Plan A thesis or Plan B project. These project advisors will be the official advisors of record. Depending on their familiarity with the program and its requirements, project advisors may also provide academic advising, but the DGS and staff are always available as resources. Advisors must be graduate faculty in the HINF graduate program, and may not serve as external members on the master's committee (see below). Only the GPC is able to change students' advisors in the University system, so students must notify the GPC when they have identified their advisors, even if it is the DGS. Students must have an advisor on record before they can submit their GPAS report.

Required Courses for the MS

Course	Credit(s)	Semesters offered	Notes
Health Informatics I HINF 5430	3	Fall Spring	
Health Informatics II HINF 5431	3	Spring	
AHC Informatics Grand Rounds HINF 5436	1 each	Fall	Must take twice
Applied Health Care Databases HINF 5510	3	Fall	
Clinical Informatics and Patient Safety HINF 5520	2	Spring	
Health Care Analytics and Data Science HINF 5531	3	Spring	
Plan B Project/ Thesis Credits HINF 8770/ HINF 8777	4/10	Fall Spring Summer	

Population Health Informatics NURS 7108	2	Fall	Contact the School of Nursing for more information
Biostatistics I PUBH 6450	4	Fall Spring	Contact the School of Public Health for a permission number
Electives	10/4		
TOTAL	36		

Transferred and Waived Courses

MS Plan A students must complete 22 credits (including 10 thesis credits) as a student in the MS program, and MS Plan B students must complete 20 credits as a student in the MS program. Any other credits may be transferred from another UMN program, non-degree status, or a regionally accredited university. All transfer credits must meet the program requirements and be approved by the advisor and the DGS.

Students are not able to use undergraduate credits used to satisfy their major requirements as transfer credits in their graduate degree. Students can work with their undergraduate advisor to find courses taken as an undergraduate, but not used to satisfy their major, to transfer in. This must be approved by both their graduate advisor, as well as their undergraduate advisor. https://onestop.d.umn.edu/sites/onestop.umn.edu/files/forms/otr028_transfer_credits_undergraduate_to_graduate.pdf

Students also have the option of waiving required courses if they have taken other courses that meet program requirements. The DGS must approve waivers. Students who have courses waived will have to take an equal number of elective credits in order to earn a total of 36 credits in the program.

Graduate Planning & Audit System (GPAS)

Students use GPAS to plan the courses they are going to take and to see how the courses they have taken fulfill the program requirements. A GPAS report must be submitted and approved before students are able to access the graduation packet.

Students must have all transferred/waived coursework entered into their GPAS before submission. Please contact the GPC before you begin working on your GPAS if you have transfer/waived credits.

We reserve the right to put a hold on the record of any students who have not submitted a GPAS report in the semester before they plan to graduate. This is because students cannot request a gradation packet until the Graduate School has processed their courses. Please plan accordingly.

Graduation Packet

The graduation packet contains forms that students need to complete their degrees and graduate. Students must request the graduation packet online at https://onestop.umn.edu/academics/graduation-checklist-grad-students. Forgetting about the graduation packet is the *most common mistake* students make. It can have a *profound impact* on when they are able to graduate. Keep the following in mind:

1. MS students cannot request a grad packet until the Graduate School has processed their committees.
2. Only students who have requested the grad packet may participate in commencement.
3. Students will not be penalized for submitting their forms early. If circumstances change so that they are not able to graduate in the intended month, students should email GSSP@umn.edu to request a new month.

Plan A students' graduation packets contain:

1. Link for the online Application for Degree- due by the first day of the month of graduation
2. Reviewers' Report- due to GSSP before the defense
3. Final Exam Report- due to the GSSP by the last day of the month of graduation
4. Instructions for submitting the thesis

Plan B students' graduation packets contain:

1. Link for the online Application for Degree- due by the first day of the month of graduation
2. Final Examination Report- due to OneStop by the last day of the month of graduation

MS Committees

In addition to an advisor, MS students need to select at least two faculty members to review the presentation of their final projects (either MS thesis or Plan B project) with the advisor. One committee member must be external to the HINF graduate faculty. This person may be a member of the HINF graduate faculty as long as he or she also has an appointment in another graduate program and is serving as a representative from that program. Students who have declared a formal minor must include a representative from that minor as the external committee member. Experts who do not have a graduate faculty appointment in the university may be able to serve as committee member if there are no similar experts at the university. The program, college, and university all have to approve such expert appointments. Students interested in this option should discuss the situation with the DGS and email the GPC for more details.

The Graduate School requires that MS students have a committee on file at least one month before their final project submission, but we recommend that students assign their committees as soon as it is reasonable. Students are able to change their committee members later if necessary. For further instructions or to assign or update a master's committee, see https://onestop.umn.edu/academics/examination-committees. For more information about committee member eligibility, see the Appointments to Graduate Examination Committees policy in the university's policy library, www.policy.umn.edu.

Plan A Thesis

As noted above, the Plan A master's degree culminates in a master's thesis. This thesis represents approximately 300 hours of work. Students work with their advisors and their committee members to determine an appropriate master's thesis topic. They should look beyond their courses, attend seminars, and read pertinent journals so they are well informed when they pick their thesis topic. Students must prepare a brief proposal (4-5 pages) that describes the intended project, which the committee must review and approve before students begin researching. 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 consult with their advisor to plan when to register for thesis credits, this can be done before your final semester. Students should discuss the length and level of detail of the thesis with their advisors. While it is beyond the scope of this handbook to attempt a comprehensive description of thesis efforts, the graduation packet includes formatting guidelines, and students may use the Plan A theses filed in the Collaboratory as reference.

After students finish writing their Plan A thesis, they must submit the thesis to their committee members for review. Committee members have 14 days to approve the thesis, by signing the Reviewers' Report form (part of the graduation packet), before students may defend their thesis. No later than the day before the defense, students must submit the signed Reviewers' Report form to the Graduate Student Services and Progress (GSSP) office.

Students are responsible for working with their committee members and IHI staff to schedule the thesis defense. MS defenses are closed events; only the committee is permitted to attend. They usually take two hours, but the committee is neither obligated to use all of that time nor to stop at the end of it. All members of the committee must be present for the defense in some form: face-to-face, videoconference, and teleconference are all acceptable. Please note the Graduate School only accepts one faxed or scanned signature on the final report form. For more Graduate School requirements and recommendations related to remote committee members, see the appendix to the related policy: https://policy.umn.edu/education/gradexamcommittee

The committee will assign a grade of either pass or fail, determined by a simple majority. Students who fail may retake the examination if all or all but one of the committee members approve the retake. Failure on the second attempt will lead to dismissal from the program. In the event that the committee cannot make an immediate decision, the committee chair may call a recess. More information is available at https://policy.umn.edu/education/mastersperformance

After the defense, the GPC will copy the signed exam report and email it to the student. Students are responsible for submitting the original to the Graduate School by the last day of the month. Students also have until the end of the month to submit the final draft of the thesis, according to the instructions included in the grad packet.

Plan B Project

As noted above, Plan B 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." Students should discuss the length and level of detail of the project with their advisors. While it is beyond the scope of this handbook to attempt a comprehensive description of Plan B projects, students may use the projects filed in the Collaboratory as reference.

Students are responsible for working with their committee members and IHI staff to schedule the Plan B oral exam. Oral exams usually take two hours, but the committee is neither obligated to use all of that time nor to stop at the end of it. All members of the committee must be present for the exam in some form: face-to-face, videoconference or teleconference are all acceptable. Please note the Graduate School only accepts one faxed or scanned signature on the final report form. For more Graduate School requirements and recommendations related to remote committee members, see the appendix to the related policy: https://policy.umn.edu/education/masterscompletion

The committee will assign a grade of either pass or fail, determined by a simple majority. Students who fail may retake the examination if all or all but one of the committee members approve the retake. Failure on the second attempt will lead to dismissal from the program. In the event that the committee cannot make an immediate decision, the committee chair may call a recess.

After the defense, the GPC will copy the signed exam report and email it to the student. Students are responsible for submitting the original to the Graduate School by the last day of the month.

Doctor of Philosophy (PhD)

Health informatics (also known as biomedical informatics) is an interdisciplinary field of scholarship that applies computer, information, statistical, management, and related scientific methods to enable biomedical discovery and support the effective and efficient use and analysis of data, management of information, and application of knowledge across the spectrum from basic science to clinical care. The ultimate goal of the field is to improve the health, well-being, and economic functioning of society.

The PhD is a 70-credit degree designed for students seeking the highest level of advanced training in the area of health informatics. It is a degree where students apply their knowledge and skills to an original research project that they report in a doctoral thesis. Students take a sequence of core courses in health informatics, computing, and biostatistics, and electives in technical and health science areas, and pursue one of four tracks: Data Science and Informatics for Learning Health Systems; Clinical Informatics; Translational Bioinformatics; or Precision and Personalized Medicine (PPM) Informatics. Students pursuing the Data Science and Informatics for Learning Health Systems track are expected to complete the University's Data Science MS degree en route to the PhD. Students pursuing the Clinical Informatics tracks are expected to complete the MS Informatics degree en route to the PhD. Students in the other two tracks have the option of adding on the MS Informatics degree if they choose.

After completing most or all of the required PhD coursework students, with the help of their advisors, will determine an appropriate time to take the Preliminary Written Examination (PWE). When they have passed the PWE, they will take the Preliminary Oral Examination (POE). Students who have passed both preliminary exams and finished all of their coursework will be admitted to candidacy for the Doctor of Philosophy degree. Candidates undertake the research and writing activities that lead to the doctoral thesis. In order to earn a PhD, candidates must have their thesis approved by their reviewers, and must successfully defend it in a public oral defense.

PhD Tracks

Clinical Informatics

Track Chair: Dr. Rui Zhang, zhan1386@umn.edu

The Clinical Informatics track provides instruction and training for students interested in clinical applications methods and applications. The curriculum includes instruction in health data and coding, systems analysis, human-computer interaction, current informatics research, and current applications such as decision support systems, natural language processing, and predictive modeling. Additionally, students learn biostatistical methods, relational database theory and practice, analytics and data science methodologies, consumer health informatics, and interprofessional practice. Electives supplement individual student interests in areas such as computer programming, health data management, health care finance, and public and population health (with scope to include person-empowered participation and inter-professional engagement). Courses use a mixture of theoretical and applied subject matter to provide a solid grounding in current informatics thinking and practice.

Students who pursue the Clinical Informatics track must complete the Health Informatics MS degree en route to completing the PhD. Students are free to choose the Plan A or Plan B MS and must notify the GPC when they would like to add the MS to their track. Students must consult with the program to coordinate completion of coursework and other requirements for the Health Informatics MS, the Health Informatics PhD, and the Clinical Informatics track. Students who have an MS in Health Informatics from a comparable program may be exempt from this requirement in whole or in part, subject to program review and approval.

Course	Course Name	Credit(s)	Semester(s)
HINF 5430	Foundations of Health Informatics I	3	Fall Spring
HINF 5431	Foundations of Health Informatics II	3	Spring
HINF 5436	AHC Informatics Grand Rounds (x2)	1 each	Fall
HINF 5440	Foundations of Translational Bioinformatics	3	Spring
HINF 5496	Internship in Health Informatics	3-6	Fall Spring Summer
HINF 5510	Applied Health Care Databases	3	Fall
HINF 5520	Informatics Methods for Health Care Quality, Outcomes, and Patient Safety	2	Spring
HINF 5531	Health Care Analytics and Data Science	3	Spring
HINF 8430	Foundations of Health Informatics I Lab	2	Fall
HINF 8431	Foundations of Health Informatics II Lab *Currently not offered, make up with elective credit	2	Spring
HINF 8440	Foundations of Translational Bioinformatics Lab	2	Spring
HINF 8525	Health Informatics Teaching	2	Occasionally
HINF 8888	Doctoral Thesis Credits	24	Fall Spring Summer
NURS 7108	Population Heath Informatics	2	Fall
PUBH 6450	Biostatistics I	4	Fall Spring
PUBH 6451	Biostatistics II	4	Spring
Electives		2-6	
TOTAL		70	

Data Science and Informatics for Learning Health Systems

Track Chair: Dr. Gyorgy Simon, simo0342@umn.edu

The Data Science and Informatics for Learning Health Systems track builds on the highly regarded data science program offered jointly by the School of Engineering, School of Public Health, and School of Statistics. It also takes advantage of School of Nursing's breadth of nursing and health informatics courses. It requires students to fulfill the requirements of the Masters in Data Science program and use their elective courses to gain exposure to health sciences and health care in the form of a suite of required foundational courses: Foundations of Health Informatics I and Lab, Foundations of Translational Bioinformatics I and Lab and the US Health Care System offered by the Institute for Health Informatics. The MS capstone project will address a research question related to health sciences or healthcare. Specialization to the health care field intensifies at the PhD level by offering additional courses focusing on advanced analytics and its applications to healthcare. The thesis research will naturally relate to health science or healthcare.

Students who pursue the Data Science and Informatics for Learning Health Systems track are expected to earn the University's Data Science MS degree en route to completing the PhD. Students must consult with the program to coordinate completion of coursework and other requirements for the Data Science MS, the Health Informatics PhD, and the Data Science and Informatics for Learning Health Systems track. Credits earned in the University's Data Science MS program may be used to fulfill required courses or elective credits in the Data Science and Informatics for Learning Health Systems track, subject to program approval. Students who have an MS in Data Science from a

comparable program may be exempt from this requirement in whole or in part, subject to program review and approval.

Course	Course Name	Credit(s)	Semester(s)
*HINF 5430	Foundations of Health Informatics I	3	Fall Spring
*HINF 5436	AHC Informatics Grand Rounds (x2)	1 each	Fall
*HINF 5440	Foundations of Translational Bioinformatics	3	Spring
HINF 5496	Internship in Health Informatics	3-6	Fall Spring Summer
HINF 5510	Applied Health Care Databases: Database Principles and Data Evaluation	3	Fall
HINF 5630	Clinical Data Mining	3	Occasionally Fall
HINF 8220	Computational Causal Analytics	3	Spring
*HINF 8430	Foundations of Health Informatics I Lab	2	Fall
*HINF 8440	Foundations of Translational Bioinformatics Lab	2	Spring
HINF 8492	Advanced Readings or Research in Health Informatics	6	Fall Spring Summer
HINF 8525	Health Informatics Teaching	2	Occasionally
HINF 8888	Doctoral Thesis Credits	24	Fall Spring Summer
Electives	(may be from the Data Science MS degree with program approval)	11-14	
TOTAL		70	

*= courses taken as part of or at the same time as the MS in data science

Translational Bioinformatics

Track Chair: Dr. Steven Shen, shens@umn.edu

The Translational Bioinformatics track bridges genomics and bioinformatics to precision medicine through its methods and techniques development and innovation that directly relate to the study of basic biological science and diseases. The computational methods related to genomics, epigenomics, transcriptomics, proteomics, metabolomics and pharmacogenomcis are included, which build the connection of molecular findings and phenotypes to characterize disease susceptibility or determine disease markers, and predict response to treatment and prognosis. The program offers three specialized areas: structural and functional genomics, microbiomics and metagenomics, and cancer genomics.

Students pursuing the Translational Bioinformatics track can earn the Health Informatics MS degree en route to completing the PhD if they so choose. Students must consult with the program to coordinate completion of coursework and other requirements for the Health Informatics MS, the Health Informatics PhD, and the Translational Bioinformatics track.

Course	Course Name	Credit(s)	Semester(s)
HINF 5430	Foundations of Health Informatics I	3	Fall Spring
HINF 5436	AHC Informatics Grand Rounds (x2)	1 each	Fall
HINF 5440	Foundations of Translational Bioinformatics	3	Spring
HINF 5496	Internship in Health Informatics	3	Fall Spring

			Summer
HINF 5650	Integrative Genomics and Computational Methods	3	Occasionally
HINF 8220	Computational Causal Analytics	3	Spring
HINF 8430	Foundations of Health Informatics I Lab	2	Fall
HINF 8440	Foundations of Translational Bioinformatics Lab	2	Spring
HINF 8492	Advanced Readings and Research	3	Fall Spring Summer
HINF 8525	Health Informatics Teaching	2	Occasionally
HINF 8888	Thesis Credits	24	Fall Spring Summer
BIOC 8007	Molecular Biology of DNA	2	Fall
BIOC 8008	Molecular Biology of RNA	2	Fall
CSCI 5421	Advanced Algorithms and Data Structures	3	Fall Spring
CSCI 5525	Machine Learning	3	Fall, even years
STAT 8051	Advanced Regression Techniques: linear, nonlinear and nonparametric methods	3	Fall
STAT 8052	Applied Statistical Methods 2: Design of Experiments and Mixed -Effects Modeling	3	Spring
Electives		4	
TOTAL		70	

Precision and Personalized Medicine

Track Chair: Dr. Terry Adam, adamx004@umn.edu

The Precision and Personalized Medicine Informatics track provides a didactic program for students training in informatics who will develop specialized knowledge in precision informatics methods applied to personal and population health-focused problems. The scope of this track includes social determinants of health and inter-professional research and expertise. Students will develop skills in quantitative methods and biomedical sciences for their application to precision medicine. In addition, students will gain an understanding of medical and biological science to provide needed context on which to apply informatics methods.

Students who pursue the Precision and Personalized Medicine Informatics track can earn the Health Informatics MS degree en-route to completing the PhD if they so choose. Students must consult with the program to coordinate completion of coursework and other requirements for the Health Informatics MS, the Health Informatics PhD, and the Precision and Personalized Medicine Informatics track.

Course	Course Name	Credit(s)	Semester(s)
HINF 5430	Foundations of Health Informatics I	3	Fall Spring
HINF 5436	AHC Informatics Grand Rounds (x2)	1 each	Fall
HINF 5440	Foundations of Translational Bioinformatics	3	Spring
HINF 5450	Foundations of Precision Medicine Informatics	3	Occasionally
HINF 5496	Internship in Health Informatics	3	Fall Spring Summer
HINF 5510	Applied Health Care Databases: Database Principles and Data Evaluation	3	Fall

HINF 5520	Informatics Methods for Health Care Quality, Outcomes, and Patient Safety	2	Spring
HINF 5531 HINF 5630	Health Data Analytics and Data Science OR Clinical Data Mining	3	Spring Occasionally
HINF 8430	Foundations of Health Informatics I Lab	2	Fall
HINF 8440	Foundations of Translational Bioinformatics Lab	2	Spring
HINF 8492	Advanced Readings and Research	3	Fall Spring Summer
HINF 8525	Health Informatics Teaching	2	Fall Spring
HINF 8888	Thesis Credits	24	Fall Spring Summer
PHAR 6224	Pharmacogenomics: Genetic Basis for Variability in Drug Response	2	Spring
PUBH 7401	Fundamentals of Biostatistical Inference	4	Fall
PUBH 7402	Biostatistics Modeling and Methods	4	Spring
Electives		5	
TOTAL		70	

Advising

In order to ensure that all PhD students have the best possible educational experience, we have developed a dual-advisor policy to create a personal, professional advising system that meets the needs of each of our students. In most cases, the track lead, with the help of the Director of Graduate Studies (DGS)and IHI staff, will provide initial academic advising concerning coursework and related matters. This is why the track lead appears as your advisor when you first enroll in the program. Academic advisors provide advice to all students in selecting coursework that meets their degree requirements, and they provide assistance in developing a course plan that meets students' academic goals.

One or two graduate faculty members will advise PhD students with the PhD thesis. These advisors will be the official advisors of record. Depending on their familiarity with the program and its requirements, project advisors may provide academic advising, but the DGS and staff are always available as resources. Advisors must be graduate faculty in the HINF graduate program, and may not serve as external members on either the preliminary or the final exam committees. They also must not serve as chair of the final exam committee. PhD advisors must have served on a PhD Final Examination Committee in either the Health Informatics graduate program, another graduate program at the University of Minnesota, or an equivalent doctoral program at another university. Furthermore, they must have advised an informatics PhD student through to completion under the mentorship of a faculty member who is already qualified as a PhD advisor.

A student may change advisors if the current advisor and the new advisor both agree. Only the GPC is able to change students' advisors in the university system, so students must notify the GPC when they have identified their advisors, even if it is the DGS. Students must have an advisor on record before they can submit their GPAS report.

Students who do not have an advisor by the beginning of their second year must take one credit of research rotations with a Health Informatics faculty member every semester until they find a permanent advisor. Students may register for research rotations before their second year to facilitate finding an advisor, but it is not required at that time.

Transferred and Waived Courses

PhD students must complete 12 course credits and 24 thesis credits as a student in the Health Informatics PhD program. Other credits may be transferred from another UMN program, non-degree status, or a regionally accredited university. All transfer credits must meet the program requirements and be approved by the advisor and the DGS.

Students are not able to use undergraduate credits used to satisfy their major requirements as transfer credits in their graduate degree. Students can work with their undergraduate advisor to find courses taken as an undergraduate, but not used to satisfy their major, to transfer in. This must be approved by both their graduate advisor, as well as their undergraduate advisor.
https://onestop.d.umn.edu/sites/onestop.umn.edu/files/forms/otr028_transfer_credits_undergraduate_to_graduate.pdf

Students also have the option of waiving required courses if they have taken other courses that meet program requirements. The DGS must approve waivers. Students who have courses waived will have to take an equal number of elective credits in order to earn the 46 course credits in the program.

Graduate Planning & Audit System (GPAS)

Graduate Planning & Audit System (GPAS)
Students use GPAS to plan the courses they are going to take and to see how the courses they have taken fulfill the program requirements. A GPAS report must be submitted and approved before students are able to access the graduation packet.

Students must have all transferred/waived coursework entered into their GPAS before submission. Please contact the GPC before you begin working on your GPAS if you have transfer/waived credits.

We reserve the right to put a hold on the record of any students who have not submitted a GPAS report in the semester before they plan to graduate. This is because students cannot request a gradation packet until the Graduate School has processed their courses. Please plan accordingly.

Preliminary Oral Report

See Preliminary Exam Process below for information.

Graduation Packet

The graduation packet contains forms that students need to complete their degrees and graduate. Students must request the graduation packet online at:
https://onestop.umn.edu/academics/graduation-checklist-grad-students
Forgetting about the graduation packet is the *most common mistake* students make. It can have a *profound impact* on when they are able to graduate. Keep the following in mind:

1. PhD students cannot request a grad packet until they have passed their preliminary examinations and completed their thesis credits.
2. Only students who have requested the grad packet may participate in commencement.
3. Students will not be penalized for submitting their forms early. If circumstances change, and they are not able to graduate in the intended month, students should email GSSP@umn.edu to request a new month.

PhD students' graduation packets contain:

1. Link for the online Application for Degree- due by the first day of the month of graduation
2. Reviewers' Report (exchange for the Final Examination Report)- due before the defense
3. Instructions for submitting the thesis

The final exam report and the thesis are due the last day of the month of graduation.

Preliminary Exam Process

There are two preliminary examinations PhD pre-candidates must pass to become PhD candidates: the Preliminary Written Exam (PWE) and the Preliminary Oral Exam (POE). The preliminary examinations assess whether students have achieved the necessary level of knowledge and skills to complete an original research project in the field of health informatics. They are designed to evaluate what students have learned from the courses they have taken and whether or not their proposed research meets the criteria for an original, high quality research project.

Preliminary Oral Exam (POE) Committee

Although the POE is the second step in the prelim process, students must have a POE committee approved by the Graduate School *before* they may start the PWE. The POE committee includes the advisor(s), one member who is external to the HINF graduate faculty, and at least two members who are internal to the HINF graduate faculty. The external member may be a member of the HINF graduate faculty as long as he or she also has an appointment in another graduate program and is serving as a representative from that program. Experts who do not have a graduate faculty appointment in the university may be able to serve on the committee if there are no similar experts at the university. The program and college both have to approve such appointments. Students interested in this should discuss the situation with the DGS and email the GPC for more details. Students who have declared a minor must have at least one member who represents the minor field. Students must also designate a chair for the committee. The advisor may chair the POE committee.

Preliminary Written Exam (PWE)

In the Health Informatics PhD program, the PWE is a 30-page research proposal rather than a written test. The two internal POE committee members who are not the advisor plus an additional graduate faculty member, chosen by the DGS, evaluate the PWE. Students are responsible for choosing the PWE topic. The topic may be the intended thesis research, related to that research, or some unrelated topic. *The proposal must be of the student's own creation.* Students are encouraged to consult with their advisors and members of their examining committee in selecting a topic; however, the specifics of the PWE must be the student's own work. Students may not use any research grant application written by their advisor in preparing the proposal. Students must conform to the ethical guidelines promulgated in the Code of Conduct and may not consult with other students or others outside the University of Minnesota in preparing the PWE.

PWE Structure and Content

The PWE should include 1) a statement regarding the significance of the problem; 2) a critical review of relevant literature leading to the stated hypothesis; 3) an original hypothesis about a problem in the field of health informatics; 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 scope should represent a project that can be completed by an individual within a reasonable period of time. 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 (14 pages)
IV. Anticipated Results and Alternatives (2 pages)
V. Summary and Future Directions (2 pages)
VI. References

Students who are actively enrolled in the PhD program, are in good academic standing, and have an approved GPAS and POE Committee on file with the Graduate School may start the PWE process by

notifying the DGS of their intent to take the PWE 30 days before they submit the PWE to the DGS. Although students are eligible to take the PWE at any time within the first four years of the program, we strongly recommend that they wait until they finish all or almost all of the coursework on the GPAS in order to ensure the best chance of passing the examination. Students who do not complete the PWE within the first four years are subject to dismissal from the program. The intent must include the student's name, the title of the intended PWE, a brief abstract of the intended PWE, and at least one suggestion for a third PWE reviewer from the HINF graduate faculty.

Students must submit the completed PWE to the DGS 30 days after the submission date of the "Intent to take the PWE" letter. The PWE reviewers will grade the examination and report back within 30 days of the PWE submission date. Students have three opportunities to pass the PWE without reservations. In the first and second rounds, students may receive one of three outcomes: pass, pass with reservations, or fail.

In the event of a pass with reservations, the committee chair must inform the student and the immediately. The chair has up to 10 days to convey the reservations and a timeline for completion to the student in a letter. When the student has satisfied the committee's reservations, the chair must notify the student, the DGS, and the GPC.

Students who receive a fail in the first or second round may either revise the PWE or start over from scratch, based on the committee's recommendations. In the third round, students will either pass or fail. Students who fail in the third round are subject to dismissal from the program. Once a student passes, either with or without reservations, or fails a third time, the GPC will document the outcome in the university's workflow system. The GPC will make a second entry to remove the reservations, if applicable, when a student has made the appropriate changes.

Preliminary Oral Exam (POE)

Students must take the Preliminary Oral Exam (POE) within one year of passing the PWE, or they must request an extension from the DGS. Students who do not take the POE or request an extension within the year are subject to GEC review and possible academic probation or dismissal from the program. Students are responsible for working with their committee members and the IHI staff to schedule the POE. The exam usually takes two hours, but the committee is neither obligated to use all of that time nor to stop at the end of it. All members of the committee must be present for the exam in some form: face-to-face, videoconference or teleconference are all acceptable. Please note that the Graduate School only accepts one faxed or scanned signature on the POE form. For more Graduate School requirements and recommendations related to remote committee members, see the appendix to the related policy: https://policy.umn.edu/education/doctoralperformance

Students also need to schedule the POE with the Graduate Student Services and Progress (GSSP) office *at least* one week before the exam online at https://onestop.umn.edu/academics/doctoral-oral-exam-scheduling. This will prompt the GSSP to create the Preliminary Oral Examination Report, which the student will have to pick up before the exam.

The POE is a private 1-2 hour oral presentation, during which students present their thesis proposal to their POE committee. In addition, they are responsible for the material covered in any of the courses on the GPAS, including the courses in the minor or related field section of the program. The examination commences with a defense of the PWE proposal. Then, committee members may ask questions which delve into the research proposal and areas from other courses on the GPAS. In particular, members of the examining committee representing the minor or other supporting program are encouraged to evaluate students for their breadth of knowledge.

Students have up to two opportunities to pass the POE. They may receive one of three outcomes: pass, pass with reservations, or fail. In the event of a pass with reservations, the committee chair must

inform the student immediately. The chair has up to a week to convey the reservations to the student in a letter, which must also include the steps the student needs to take to remove them. A copy of the letter must be submitted to Graduate Student Services and Progress (GSSP) with the signed Oral Examination Report Form. Students have a maximum of four months to clear the reservations. When the student has satisfied the committee's reservations, the chair must write a second letter informing the student and the Graduate School that the reservations have been removed. The student may then proceed toward the degree.

If a student fails, the committee members must decide if they will grant the student a second opportunity to pass the exam. If the committee does not give the student a second chance or the student fails the second chance, the student will be dismissed from the program. For more information about the POE grading, see the appendix to the related policy: https://policy.umn.edu/education/doctoralperformance.

Students who pass the POE attain candidacy in the program and may begin working on their dissertation.

Regardless of the result of the POE, the GPC will email a copy of the signed form to the student. The student is responsible for submitting the original to the Graduate School.

Research and Dissertation

The dissertation is an individual student's substantial addition to the body of scientific knowledge, and therefore, should be on par with the quality of work expected of a research scientist. In turn, the preliminary and final exams are tests of the student's ability to form and frame a research question and research hypothesis (or hypotheses), carry out the research and describe the results, and effectively communicate these to peers in written and oral form.

The culminating step is the presentation and successful defense of the dissertation. Candidates must submit a dissertation in one of the forms listed below that reports on an original research project conducted under the supervision of their advisor(s). The project should be based on the dissertation proposal presented during the POE and approved by the examination committee. Advisor(s) and the Final Oral Examination committee members will act as the advisory body that guides students in their work.

While the dissertation proposal presented during the POE is usually the guiding document for the doctoral research project, candidates may make modifications as they proceed with the work due to scientific or practical reasons. Minor modifications (such as a change in the number of subjects, substituting a different statistical analysis technique, etc.) need the approval of the advisor(s). Major modifications to the project (such as switching to a different study population, substituting a new study design, etc.) require approval of the entire committee. In the rare event a candidate chooses to undertake the investigation of an entirely new research question, the committee may require the candidate to prepare a new project proposal for committee approval.

With DGS permission, any PhD students who have finished the majority of their coursework may register for thesis credits (HINF 8888), regardless of candidate status. However, most students wait until they pass their preliminary exams and become PhD candidates before they register. Candidates will need to register for 24 thesis credits total, which they may split over multiple semesters. Students who are receiving support and a tuition benefit from the IHI must take 12 credits per semester until they have completed all 24 thesis credits. Students supported by research assistantships (RA) from individual faculty members may negotiate the number of credits taken in a given semester with the PI of the project. Candidates who are not ready to defend after finishing their thesis credits may register for placeholder credits such as GRAD 999 or FTE credits. As with any other degree, candidates will

need to maintain active status in the program in order to be eligible to graduate. Please see the Handbook section about maintaining active status beginning on page 7 for more information.

Requirements for the doctoral research project

1. The project must be an investigation in an area that includes but is not limited to an area of health informatics.
2. The project must be original in nature in that it is not a duplication of other published work nor a simple replication of an existing research study in a different setting.
3. The project must be original in that it is based on at least one research question that is not definitively answered in the published literature.
4. The project must hold the promise of contributing to the field of biomedical and health informatics by increasing the knowledge and understanding in a particular area of the field.
5. While software design and development are acceptable project components, they are not by themselves sufficient to constitute a project. If software development is part of the doctoral work, evidence must be presented that it meets the design specifications and functions. The dissertation must also include some form of scientifically defensible investigation of the value or impact of such software.
6. Investigations may be qualitative or quantitative in nature but must conform, in either case, to a scientifically rigorous methodology.
7. The project will consist of a defensible research question, one or more testable hypotheses derived from that research question and a set of one or more methodologies for attempting to generate answers to that research question.
8. It must include a reasonably thorough review of the related literature both with respect to the research question and the methodologies employed.
9. In the case where more than one methodology is possible, it must address the relevant merits of applicable methodological approaches and explain why the particular approach was chosen.

Students may choose one of two options for their PhD thesis: a book-style extended manuscript, or an article-style manuscript.

Book-Style Extended Manuscript

The book-style extended manuscript is a "traditional" thesis. It includes several chapters related to a single research question and study. The dissertation should include, but is not limited to, the following chapters: introduction, literature review, methods, results, discussion and conclusions, references, and appendices. Candidates must be the sole author of their dissertation document.

Article-Style Manuscript

The article-style manuscript is a single cohesive document that includes several articles related to a single research question.

1. Typically, three articles are required, but this number is a guideline and may be modified upon approval of the entire committee and the DGS.
2. Each article must:
    a. Have a target journal or be a peer-reviewed conference paper.
        i. At least one of the targeted journals must be recognized as an "informatics" journal by the committee and the DGS.
        ii. Journal articles must be formatted as required for the particular journal.
        iii. For conference papers, conference proceedings must be indexed in PubMed, or equivalent.
    b. Have the student as first author unless the student's full committee and the DGS approve another order.
    c. Be reviewed and approved by the student's dissertation committee.

   i. WARNING: The Final Oral Examination committee is *not* obligated to approve any included manuscript for the sole reason that it has already been accepted for publication or has already been published.
   ii. Prior to submission for publication, it is strongly recommended that students submit manuscripts to their committee members and obtain their approval to submit for publication.
   d. Be prepared *after* the completion of the Preliminary Oral Exam.
      It is permissible to use and cite work by the student completed, submitted, or accepted for publication prior to the Preliminary Oral Examination as background for the work reported in the Dissertation.
3. The submitted document containing the articles must be structured as follows:
   a. Introduction- Overall Introduction to the problem and the research question. The introduction must include a unified review of the literature related to the problem.
   b. Articles as Chapters
   c. Discussion and Conclusions- An overall discussion and conclusions relating the articles to each other and the research question.
   d. Appendices- See copyright section (4.a.ii.).
4. Copyright
   a. Each of the articles must be in the form of a draft whose copyright does not pass to the publisher upon acceptance for publication.
      i. This means that students may not use the published and copyrighted version of a manuscript as an Article Chapter unless the publisher/owner of the copyright gives explicit written permission to do so.
      ii. Students must submit documentation of any such approval as an appendix for your dissertation.
   b. The candidate is considered to be the sole author of the dissertation document submitted to the University of Minnesota Graduate School and owns the copyright to the document submitted to the graduate school.

Final Exam Process

Final Oral Committee

The final oral committee assesses the student's defense of his or her thesis. Students may keep the committee members from their Preliminary Oral Examination, but are not required to do so. Either way, students must submit a final committee to the Graduate School at https://onestop.umn.edu/academics/examination-committees. Unlike the POE committee, the chair of the final committee must *not* be the advisor or co-advisor.

At the same time, candidates will delegate three members of the final committee to review the written thesis. These faculty members will sign the Reviewers' Report form. The reviewers must include a minimum of two major field faculty members and one minor or outside faculty member. All advisor(s) must serve as reviewers. Students must provide reviewers with a copy of the dissertation at least 22 days before the scheduled date of the doctoral final oral examination.

Reviewers' Report

Reviewers have 21 days to access the dissertation. After they have read the dissertation, all designated reviewers must certify that the dissertation is ready for defense before by signing the Reviewers' Report, part of the Graduation Packet. Students are responsible for collecting the reviewers' signatures and for submitting it to the Graduate School in exchange for the Final Exam Report, the form committee members will sign at the end of the defense. Students must retrieve the Final Exam Form at least one day before the exam. They should give the Final Exam Report to the chair before the beginning of the exam.

Defense

Students are responsible for working with their committee members and the IHI staff to schedule the thesis defense. Students must also schedule the defense with the Graduate School at https://onestop.umn.edu/academics/doctoral-oral-exam-scheduling. PhD defenses take between two and three hours. All members of the committee must be present for the defense in some form: face-to-face, videoconference or teleconference are all acceptable. Please note the Graduate School only accepts one faxed or scanned signature on the final exam form. For more Graduate School requirements and recommendations related to remote committee members, see the appendix to the related policy: https://onestop.umn.edu/academics/examination-committees

The first portion of the exam is a public seminar during which candidates present their research. *At least one week before the exam, candidates must submit a title and a paragraph-length abstract to the GPC to distribute to the IHI listserv*. After the public defense there is a closed examination, during which the committee members ask questions related to the dissertation and relevant areas. At the end of the closed examination, the candidate leaves the room. The committee members take a secret ballot, discuss the candidate's defense, and then take a final vote. They will then sign the final exam form and let the candidate know the result. After the defense, the GPC will scan and copy the signed exam report and email it to the candidate. Candidates are responsible for submitting the original to the Graduate School by the last day of the intended month of graduation.

Submitting the thesis

Candidates have until the last day of the month of graduation to revise their thesis based on the reviewers' recommendations and to format it based on the Graduate School's requirements. Students will find specific formatting guidelines and submission instructions in the Graduation Packet. Candidates must include a cover page signed by the advisor that states that they have made the edits recommended by the final committee. These instructions are also in the Grad Packet. Candidates should remember that their thesis will be archived online and copyrighted with the UMN Digital Conservancy, which means it will be accessible to anyone who is interested in reading it for many years to come.

CONGRATULATIONS CLASS OF 2019

Appendices

Appendix A: Code of Conduct for Graduate Students in Health Informatics

All students are required by the University of Minnesota Board of Regents to comply with the University's Student Conduct Code, which can be found at https://regents.umn.edu/sites/regents.umn.edu/files/policies/Student_Conduct_Code.pdf. In addition, Health informatics professionals and professionals-in-training frequently deal with highly confidential information that must be handled in accordance with the very highest ethical standards. **Students who violate the University's Student Conduct Code or the following requirements of the Health Informatics Graduate Program are subject to sanctions up to and including academic dismissal.**

Academic Honesty
The Health Informatics Graduate Program insists on a strict policy of academic honesty for all students. Students who are suspected of academic dishonesty may be reported to the Office of Student Conduct and Academic Integrity and subject to the processes and sanctions related to academic misconduct as outlined in the Student Handbook.

Examples of Academic Misconduct include the following:

Cheating: Receiving or providing unpermitted help on an exam, copying or sharing test answers, engaging in unauthorized communication about or during an exam, giving test questions to one who hasn't taken the exam, using unauthorized material during an exam, submitting an altered exam for re-grading, taking a test for another, continuing to work on an exam when time is up, stealing others' work.

Fabrication: Fabricating or falsifying data, results, or references, e.g., in reports or papers submitted for class or in a thesis or dissertation.

Providing False Information: Giving forged excuses to postpone or avoid assignments or to add or drop classes, signing another's name or having another sign into a class, submitting recommendations for admission that were not written by the person whose name appears as the recommender.

Unauthorized Collaboration: Working with others on graded work without the instructor's permission (e.g., on in-class or take-home tests, papers, labs, or assignments).

Re-Using Work without Permission: Submitting the same work in more than one course or re-using work submitted in another course or for a different purpose, without the current instructor's permission.

Plagiarism: Using others' work (e.g., words, ideas, pictures, or data) from any source without giving proper credit. Others' words must be put in quotation marks and cited, and others' ideas must be cited even if paraphrased in the student's own words.

In addition, the student may be subject to appropriate sanctions as determined by the program and the University if he or she engages in the following:

Violating Security Rules: Allowing someone else to use your username and password, loaning any security authentication mechanism assigned to you (e.g. your UCard, IHI entry code, etc.) to others, 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.

Violating Confidentiality: In situations where the student has access to individually identifiable data that is subject to Federal and state privacy rules (e.g. HIPAA, ARRA, FERPA), accessing the data of a person without legitimate reason as defined by their job responsibilities; disseminating such data to others without permission of the person to whom the data belongs or adding to, deleting or altering that data without proper authorization from the owner of that data.

Violating Institutional Review Board (IRB) guidelines for the conduct of research: Revealing confidential patient data to those not authorized to view it, changing the experimental procedures without approval of the IRB, conducting research of any type that involve human subjects without the review and approval of the IRB.

If you do not understand all of the above items or have questions, please discuss these with your advisor or the Director of Graduate Studies for Health Informatics. When all of your questions have been answered, sign one copy and return it to the Director of Graduate Studies.

I understand the expectations of me as a graduate student that is described in the above Code of Conduct including the references to other resources. I agree that as a graduate student in Health Informatics I will abide by the rules and regulations of the program and of the University of Minnesota.

_____
Name (printed)

_____ _____
Signature Date

Appendix B: HINF Courses

Course	Credits	Semesters offered	Type
HINF 5430 Foundations of Health Informatics I	3	Fall, Spring	Required for all degrees
HINF 5431 Foundations of Health Informatics II	3	Spring	Required for MHI, MS, and Clinical track PhD
HINF 5436 Grand Rounds	1	Fall	Required for all degrees
HINF 5440 Foundations of Translational Bioinformatics	3	Spring	Required for all PhD
HINF 5494 Topics in Health Informatics	1-6	Occasionally	
HINF 5496 Internship	1-6	Fall, Spring, Summer	Independent Study
HINF 5499 Capstone Project	3	Fall, Spring, Summer	Required for MHI
HINF 5450 Foundations of Precision Medicine Informatics	3	Occasionally	Required for Precision and Personalized Medicine track
HINF 5502 Python Programming for the Health Sciences	1	Fall, Spring	Prerequisite
HINF 5510 Applied Health Care Databases: Database Principles and Data Evaluation	3	Fall	Required for MHI, MS, Clinical and PPM tracks
HINF 5520 Clinical Informatics and Patient Safety	2	Spring	Required for MHI, MS, Clinical and PPM tracks
HINF 5531 Health Care Analytics and Data Science	3	Spring	Required for MHI, MS, and Clinical track PhD
HINF 5610 Foundations of Biomedical Natural Language Processing	3	Spring	
HINF 5620 Data Visualization for the Health Sciences	3	Occasionally	
HINF 5630 Clinical Data Mining	3	Occasionally	Required for Data Science and Informatics for Learning Health Systems and PPM tracks
HINF 5650 Integrative Genomics and Computational Methods	3	Occasionally	Required for Translational Bioinformatics track
HINF 8220 Computational Causal Analytics	3	Spring	Required for Data Science and Informatics for Learning Health Systems and Translational Bioinformatics track
HINF 8333 FTE: Master's	1	Fall, Spring, Summer	Full Time Equivalency Placeholder
HINF 8405 Advanced Topics I	1-6	Fall	Elective
HINF 8406 Advanced Topics II	1-6	Spring	Elective
HINF 8430 Foundations of Health Informatics I Lab	2	Fall	Required for all PhD
HINF 8431 Foundations of Health Informatics II Lab	2	Spring	*Currently not offered
HINF 8440 Foundations of Translational Bioinformatics Lab	2	Spring	Required for all PhD

HINF 8444 FTE: Doctoral	1	Fall, Spring, Summer	Full Time Equivalency Placeholder
HINF 8492 Advanced Readings or Research	1-6	Fall, Spring, Summer	Independent Study
HINF 8525 Teaching	2	Occasionally	Required for PhD
HINF 8535 Advanced Research Methods	3	Occasionally	Required for PhD
HINF 8770 Plan B Project	4	Fall, Spring, Summer	Required for MS Plan B
HINF 8777 Thesis Credits: Master's	1-10	Fall, Spring, Summer	Required for MS Plan A
HINF 8888 Thesis Credits: Doctoral	1-24	Fall, Spring, Summer	Required for PhD

Appendix C: Capstone Cover Page

{Title}

Capstone Report
in partial fulfillment of the requirements
for the Master in Health Informatics (MHI)
in the Health Informatics Graduate Program (HINF)

by
{Name}
{Date}

Capstone Coordinator
{Name}

_____ _____
Signature Date

Project Coordinator
{Name}

_____ _____
Signature Date

Appendix D Plan B Cover Page

{Title}

Plan B Project
Submitted to the Health Informatics Graduate Program (HINF)
at the University of Minnesota

by
{Name}

In partial fulfillment of the requirements
for the degree of Master of Science

{Date}

Advisor
{Name}

_____ ____ _____
Signature Date