Health Informatics Student Handbook

For more information regarding IGPI, please visit informatics.uiowa.edu or refer to the Interdisciplinary Graduate Program in Informatics Handbook.
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Health Informatics Subprogram Description and Requirements

The primary mission of the Health Informatics Subprogram is to:

1. Train health informatics researchers for academia, industry and research institutes, and
2. Train individuals aspiring to become leaders and visionary administrators responsible for effectively involving information and computational systems in health care organizations.

Subprogram Description

Health Informatics is aimed towards improving the utilization of health care-related data, information, and knowledge in support of health care research, education, and practice. It is concerned with processes influencing the creation, organization, and manipulation of health information in varying user contexts, such as patients seeking to become more informed about diseases, physicians evaluating treatment alternatives, clinicians conducting controlled studies comparing interventions, nurses using standardized schemes to represent patient contexts and regional health organizations monitoring public health.

Health Informatics is strongly influenced and directed by developments in computing as well as in the socioeconomic context of health care. Health informatics initiatives are typically interdisciplinary involving collaborations among disciplines such as the health sciences, engineering, computer science, information sciences, mathematics, education, law, management sciences and statistics. In particular, a strong computational core is a part of the foundation of Health Informatics.

The Health Informatics Subprogram provides flexibility so that students with prior training in the health professions (e.g. medicine, nursing, public health, dentistry, or pharmacy) may establish an essential foundation in the computational areas. At the same time, students with academic backgrounds in computer science, engineering, or information science can establish a foundation in the health sciences. Please see the Course Requirements section (beginning on Page 6) for more information.

Ph.D. Program

Please check the Manual of Rules and Regulations of the Graduate College for a complete description of the Ph.D. guidelines and requirements of the Graduate College.
The requirements described here, specific to the Health Informatics Ph.D. program, are in addition to the University-wide requirements for doctoral degrees.

The Ph.D. program in the Health Informatics Subprogram inherits all course requirements of the Informatics Ph.D. program, that is, a total of 72 semester hours beyond the bachelor’s degree, with 18 semester hours satisfying the Certificate in Informatics (Health Informatics). In addition, and specific to this particular Subprogram, students must complete both Health Informatics I (3 semester hours) and Principles of Public Health Informatics (3 semester hours) as part of their 18 core semester hours.

The remaining 54 semester hours should be selected, in consultation with the student’s advisor, from disciplinary courses relevant to the student’s particular Health Informatics focus.

Please note: Students wishing to pursue an independent study (IGPI:5015, IGPI:6515 or IGPI:6510) with a University of Iowa faculty member may refer to the Independent Study guidelines on the Informatics website.

The Ph.D. also requires satisfactory performance on the comprehensive exam, and the production and formal defense of a dissertation that describes original research results. Students not already holding a University of Iowa M.S. degree may request that one be granted at the comprehensive exam. The M.S. degree is normally awarded upon successful completion of the comprehensive exam, but may also be awarded, even if the student does not pass the exam, at the examination committee’s discretion and dependent on the student having met the requirements for the M.S.

Every Ph.D. student must have a faculty advisor with an appointment in the Health Informatics program. Upon admission, each student is assigned a temporary academic advisor. During their first year in the program, it is expected that the student will choose a faculty member whose research interests align with their own to serve as academic and research advisor, and chair of the student’s thesis committee. The advisor / advisee relationship requires the consent of both parties and can be terminated by either. It is required that a student will complete a Plan of Study form (see appendix) in consultation with his/her advisor every semester, and submit the completed form to the IGPI office for approval. The Plan of Study form can also be downloaded from our website at: http://informatics.grad.uiowa.edu/health-informatics/curriculum.

**Ph.D. Guidelines & Milestones**

**Qualifier**

- Complete by fall of Year 02
- Minimum committee of 3 to 5 professors including the advisor
- Format: Research or project in the form of a paper with a presentation – pass or fail
The student will conduct a small-scale research project and present this to the committee. As an example, the research project could replicate work done in a paper of interest, optionally with a few extensions. This milestone is designed to ensure that the student starts early in gaining research experience. It is also to ensure that the student has the potential to conduct doctoral level research.

NOTE: The qualifier must be taken no later than the end of the 2nd year, first semester. Failure to do so will be counted as an exam failure.

The student may retake the qualifier once. A second failure will result in termination from the program.

Comprehensive Exam

- Expected in Fall Year 03, allowing flexibility to accommodate scheduling of specific courses
- Format: A written take-home exam followed by an oral defense
- Committee: Minimum of five professors with at least two affiliated with the IGPI
- Note: This examination satisfies the University’s comprehensive exam requirement.

The committee will prepare a set of open-ended questions covering the student’s prior coursework, with an emphasis on their chosen research direction. The questions should cover 2-3 broad subject areas, but must include at least one computational and one clinical area. The exam will run for two weeks. Answers will be written up in a report format (including citations), with each section taking around five pages. Following the submission and grading of the exam, an oral defense will be held. Grades consist of pass, fail and reservations. A student receiving a failing grade may retake the exam once but needs to do so successfully by the end of the following semester.

Proposal Defense

- Year 04
- Format: Written proposal and presentation
- Committee: Minimum of five professors with at least two affiliated with the IGPI.

The student will present a proposal to the committee a minimum of two weeks prior to the date of the proposal defense. Generally this will in the form of two chapters: first a literature review and second an outline of proposed research. The proposal presentation will emphasize an overview of the background research with most of the presentation time used to outline the planned research. This opportunity is designed so that the committee and the student agree on the research required for completion of the Ph.D.
Final Oral Defense

- Format: Written thesis and presentation
- Committee: Minimum of five professors with at least two affiliated with the IGPI.

The student will present a complete thesis to the committee a minimum of two weeks prior to the date of the thesis defense. The student will motivate the research, present key findings and conclusions, and offer a critical inquiry of different facets of the research.

In addition to the formal examination process, students in the Ph.D. program are evaluated on a yearly basis to ensure that they are making satisfactory academic progress. By September 15th, each student and their advisor are required to submit an evaluation assessment of the student’s progress outlining past year accomplishments and plans for the current year including Ph.D. milestones. The Advisory Board reviews these summaries and sends the student a letter summarizing their status in the program. Students who are failing to make satisfactory progress are expected to correct any deficiencies and move to the next milestone within one year. Failure to do so will result in dismissal from the program.

Master of Science

Please check the Manual of Rules and Regulations of the Graduate College for a complete description of the M.S. guidelines and requirements of the Graduate College. The requirements described here are in addition to the university-wide requirements for master’s degrees.

The M.S. program in the Health Informatics Subprogram offers an M.S. thesis/non-thesis option and requires completion of a minimum of 32 course semester hours beyond the bachelor's degree with at least 18 of the 32 hours satisfying the requirements of the Certificate in Informatics.

Please note: Students wishing to pursue an independent study (IGPI:5015, IGPI:6515 or IGPI:6510) with a University of Iowa faculty member may refer to the Independent Study guidelines on the Informatics website.

M.S. – Final Exam Procedures (with and without thesis)

1. The student in conjunction with his/her adviser will set up a committee of at least three U of I faculty members who are sufficiently familiar with his/her coursework.
   a. At least two of the faculty members must be members of the UI tenure-track faculty
b. At least two of the faculty members are from the major department (defined as formally appointed to the program) and are members of the tenure-track faculty.

   c. The final committee will be approved by the director of the Subprogram.

2. A meeting will be scheduled during which the student is asked to make a brief presentation that summarizes the knowledge acquired in the program or defend their thesis if the M.S. with thesis option was chosen. If the student chooses the without thesis option topics of presentation might include one or more term projects completed in the course of study. This will be followed by a brief Q&A.

**Graduate Certificate**

The Certificate in Informatics is open to graduate students in good standing, and applicants to the non-degree program, who wish to complement their own disciplinary studies with foundational and applied knowledge in informatics. Students must complete a minimum of 18 s.h. for the Informatics Certificate, including 6 s.h. in the Health Informatics Core, and 9 s.h. in the Foundations of Informatics.

Plans for the Certificate in Informatics may not completely substitute for coursework or examinations required within the requirements of the disciplinary degree program. A minimum of 9 s.h. of coursework must be completed independently from other degree requirements.

**Course Requirements for the Ph.D., M.S. and Certificate Programs**

**Health Informatics Core (6 s.h.)**

All students must take the following two courses:

- EPID:5200 (173:120) Principles of Public Health Informatics (3 s.h.)
- IGPI:5200 (200:110) Health Informatics I (3 s.h.)

**Foundations of Informatics (12 s.h. Ph.D.; 9 s.h. M.S. & Certificate)**

Ph.D. students must complete 3 s.h. in each of areas a.), b.), c.) and d.), following. M.S. students must complete 3 s.h. from each of a.), b.) and c.), following.
a.) Introductory Informatics (3 s.h.)
   - CS:3110 (22C:104) Introduction to Informatics (3 s.h.)

b.) Programming (3 s.h.)
   - CS:3210 (22C:109) Programming Languages and Tools (3 s.h.)
   - MSCI:9200 (06K:226) Business Programming (M.S. only; 3 s.h.)
   - BME:5320 (051:123) Bioinformatics Techniques (3 s.h.)

c.) Database Systems (3 s.h.)
   - MSCI:4220 (06K:186) Database Management II (3 s.h.)
   - SLIS:6100 (021:124) Database Systems (3 s.h.)
   - CS:4400 (22C:144) Database Systems (3 s.h.)

d.) Specialization (3 s.h.; Ph.D. only)
   - MSCI:6421 (06K:275) Knowledge Discovery (3 s.h.)
   - MSCI:9240 (06K:234) Knowledge Management (3 s.h.)
   - MSCI 6800 (06K:278) Web Mining (3 s.h.)
   - CS:4460 (22C:146) Introduction to Computational Linguistics (3 s.h.)
   - CS:4980 (22C:196) Topics in Computer Science II (3 s.h.)

Statistics and Research Methodology (9 s.h. Ph.D.; 3 s.h. M.S.)

Ph.D. students must complete three of the following courses, below.
M.S. students must complete one course from below.

   - NURS:7002 (096:338) Designing Research (3 s.h.)
   - BIOS:5110 (171:161) Introduction to Biostatistics (3 s.h.)
   - BIOS:5120 (171:162) Design and Analysis of Biomedical Studies (3 s.h.)
   - STAT:3120 (22S:120) Probability and Statistics (M.S. only; 3 s.h.)
   - GHS:3010 (152:150) Research Design in Global Health (3.s.h.)

Ethical Conduct of Research (1 s.h.; Ph.D. only)

   - GRAD:7270 (650:270) Principles of Scholarly Integrity (1 s.h.)

Major (9 s.h.; Ph.D. only)

Ph.D. students must complete 9 s.h. of coursework specific to a chosen major field.
Potential majors include:

a. Public Health Informatics
b. Clinical Informatics (includes Medical Research, Nursing, Dentistry, Imaging, and Translational Science)

Please note: These course requirements are effective for students admitted to the program beginning with the spring 2014 term or thereafter.

**Health Informatics**

**Sample Electives by College**

Included below is a list of potential electives that may be appropriate for Health Informatics (HI) students. Each HI student’s plan of study is unique, and needs to be coordinated in careful consultation with his/her designated academic advisor. Courses not on this list may be credited to the HI plan of study with the approval of the student’s advisor and the HI advisory board. Students with a computational background will be expected to use their coursework to develop expertise in the health sciences, while students with a health background will need to focus more on computing courses.

**College of Business**

Management Sciences

- MSCI:9110 (6K:217) Advanced Analytics (3 s.h.)
- MSCI:9200 (6K:226) Business Programming (3s.h)
- MSCI:9240 (6K:234) Knowledge Management (3 s.h.)
- MSCI:6200 (6K:272) Database Analysis and Design (3 s.h.)
- MSCI:6421 (6K:275) Knowledge Discovery (3 s.h.)
- MSCI:6800 (6K:278) Web Mining (3 s.h.)

MBA Program

- MBA:8150 (6N:216) Data and Decisions (3 s.h.)

**College of Engineering**

Biomedical Engineering

- BME:5330 (51:122) Computational Genomics (3 s.h.)
• BME:5320 (51:123) Bioinformatics Techniques (3 s.h.)
• BME:5251 (51:141) Advanced Biosystems (3 s.h.)
• BME:5610 (51:150) Musculoskeletal Biomechanics (3 s.h.)
• BME:5640 (51:152) Ergonomics of Occupational Injuries (3 s.h.)
• BME:5510 (51:154) Cardiac and Vascular Mechanics (3 s.h.)
• BME:5620 (51:157) Intro to Applied Biomedical Finite Element Modeling (3 s.h.)
• BME:5401 (51:170) Graduate Biomaterials and Implant Design (3 s.h.)
• BME:5920 (51:179) Fast-Track Biomedical Engineering Design II (3 s.h.)
• BME:5200 (51:182) Biomedical Signal Processing (3 s.h.)
• BME:5210 (51:185) Medical Imaging Physics (3 s.h.)
• BME:5020 (51:192) Seminar in Bioinformatics (1 s.h.)
• BME:6310 (51:225) Contemporary Topics in Bioinformatics (3 s.h.)

Chemical and Biochemical Engineering

• CBE:5205 (52:108) Introduction to Biochemical Engineering (3 s.h.)
• CBE:4156 (52:156) Scanning Electron Microscopy and X-ray Microanalysis (3 s.h.)

Civil and Environmental

• CEE:4515 (53:115) Computer-Aided Engineering (3 s.h.)
• CEE:4159 (53:159) Air Pollution Control Technology (3 s.h.)
• CEE:6151 (53:251) Environmental Systems Modeling (3 s.h.)

Electrical and Computer Engineering

• ECE:5450 (55:145) Pattern Recognition (3 s.h.)
• ECE:5460 (55:146) Digital Signal Process (3 s.h.)
• ECE:5480 (55:148) Digital Image Processing (3 s.h.)
• ECE:5640 (55:164) Computer-Based Control Systems (3 s.h.)
• ECE:5800 (55:180) Fundamentals of Software Engineering (3 s.h.)
• ECE:7450 (55:245) Magnetic Resonance Imaging Systems (3 s.h.)
• ECE:7470 (55:247) Image Analysis and Understanding (3 s.h.)
• ECE:7480 (55:248) Advanced Digital Image Processing (3 s.h.)

Mechanical and Industrial Engineering

• IE:3350 (56:134) Process Engineering (3 s.h.)
• IE:3400 (56:144) Human Factors (3 s.h.)
• IE:3450 (56:147) Ergonomics (3 s.h.)
• IE:3500 (56:150) Information Systems Design (3 s.h.)
• IE:4500 (56:160) Operational Systems Design (4 s.h.)
• IE:3750 (56:178) Digital Systems Simulation (3 s.h.)
• IE:3700 (56:171) Operations Research (3 s.h.)
• IE:6300 (56:230) Innovation Science Studies
• IE:6350 (56:235) Computational Intelligence (3 s.h.)
• IE:6420 (56:242) Human/Computer Interaction (3 s.h.)
• IE:6440 (56:244) Airborne Design of Experiments (3 s.h.)
• IE:6600 (56:270) Linear Programming (3 s.h.)
• IE:6720 (56:271) Nonlinear Optimization (3 s.h.)
• IE:6750 (56:274) Stochastic Optimization (3 s.h.)

Mechanical Engineering

• ME:4110 (58:110) Computer-Aided Engineering (3 s.h.)
• ME:4111 (58:111) Numerical Calculations (3 s.h.)
• ME:4115 (58:115) Finite Element I (3 s.h.)
• ME:5362 (58:134) Computer-Based Control Systems (3 s.h.)
• ME:6215 (58:215) Finite Element II (3 s.h.)
• ME:7269 (58:269) Computational Fluid Dynamics and Heat Transfer (3 s.h.)

College of Law

• LAW:8562 (91:261) Health Law (2-3 s.h.)

College of Liberal Arts and Sciences

Biology

• BIOL:3172 (002:131) Evolution (4 s.h.)
• BIOL:4373 (002:160) Molecular Phylogenetics (3 s.h.)
• BIOL:4273 (002:162) Population Genetics and Molecular Evolution (3 s.h.)
• BIOL:4213 (002:170) Bioinformatics (4 s.h.)
• BIOL:3314 (002:178) Genomics (3 s.h.)

Computer Science

• CS:3110 (22C:104) Introduction to Informatics (3 s.h.)
• CS:3210 (22C:109) Programming Languages and Tools (3 s.h.)
• CS:4400 (22C:144) Database Systems (3 s.h.)
• CS:4420 (22C:145) Artificial Intelligence (3 s.h.)
• CS:4460 (22C:146) Introduction to Computational Linguistics (3 s.h.)
• CS:4720 (22C:174) Optimization Techniques (3 s.h.)
• CS:5800 (22C:180) Fundamentals of Software Engineering (3 s.h.)
• CS:4980 (22C:196) Topics in Computer Science II (e.g. data mining, fundamentals of web programming, sensor networks, privacy and anonymity) (arr.)

Mathematics
• MATH:4610 (22M:140) Continuous Mathematical Models (2 s.h.)
• MATH:4060 (22M:151) Discrete Mathematical Models (3 s.h.)
• MATH:4860 (22M:178) High Performance and Parallel Computing (3 s.h.)

Statistics and Actuarial Science

• STAT:3510 (22S:101) Biostatistics (3 s.h.)
• STAT:4200 (22S:105) Statistical Methods and Computing (3 s.h.)
• STAT:3120 (22S:120) Probability and Statistics (3 s.h.)
• STAT:3100 (22S:130) Introduction to Mathematical Statistics I (3 s.h.)
• STAT:3101 (22S:131) Introduction to Mathematical Statistics II (3 s.h.)
• STAT:3620 (22S:133) Quality Control (3 s.h.)
• STAT 4520 (22S:138) Bayesian Statistics (3 s.h.)
• STAT 5160 (22S:140) Design and Analysis of Biomedical Studies (3 s.h.)
• STAT:4510 (22S:150) Regression, Time Series, and Forecasting (3 s.h.)
• STAT:3200 (22S:152) Applied Linear Regression (3 s.h.)
• STAT:4100 (22S:153) Mathematical Statistics I (3 s.h.)
• STAT:4101 (22S:154) Mathematical Statistics II (3 s.h.)
• STAT:6560 (22S:156) Applied Time Series Analysis (3 s.h.)
• STAT:3210 (22S:158) Experimental Design and Analysis (3 s.h.)
• STAT:6516 (22S:159) Design of Experiments (4 s.h.)
• STAT:6540 (22S:161) Applied Multivariate Analysis (3 s.h.)
• STAT 6510 (22S:162) Applied Generalized Regression (3 s.h.)
• STAT:6547 (22S:163) Nonparametric Statistical Methods (3 s.h.)
• STAT:5200 (22S:164) Applied Statistics I (4 s.h.)
• STAT 5201 (22S:165) Applied Statistics II (3 s.h.)
• STAT 5300 (22S:166) Computing in Statistics (3 s.h.)
• STAT:6530 (22S:167) Environmental and Spatial Statistics (3 s.h.)
• STAT:5100 (22S:193) Statistical Inference I (3 s.h.)
• STAT:5101 (22S:194) Statistical Inference II (3 s.h.)
• STAT:6300 (22S:195) Probability and Stochastic Processes I (3 s.h.)
• STAT:6301 (22S:196) Probability and Stochastic Processes II (3 s.h.)
• STAT:7300 (22S:203) Foundations of Probability I (3 s.h.)
• STAT 7301 (22S:204) Foundations of Probability II (3 s.h.)
• STAT:7501 (22S:220) Analysis of Categorical Data (3 s.h.)
• STAT:7570 (22S:225) Survival Data Analysis (3 s.h.)
• STAT:7560 (22S:235) Time Series Analysis (3 s.h.)
• STAT:7520 (22S:238) Bayesian Analysis (3 s.h.)
• STAT:7400 (22S:248) Computer Intensive Statistics (3 s.h.)
• STAT:7100 (22S:253) Advanced Inference I (3 s.h.)
• STAT:7101 (22S:254) Advanced Inference II (4 s.h.)
• STAT 7200 (22S:255) Linear Models (3 s.h.)
Graduate College

Interdisciplinary Graduate Program in Informatics

- IGPI:5015/IGPI:6515 Independent Study (ARR) (*Note: Formal proposal and permission of overseeing faculty member required prior to registering for class; contact IGPI program coordinator to obtain section number.*)
- IGPI:6510 Readings in Informatics (ARR) (*Note: Formal proposal and permission of overseeing faculty member required prior to registering for class; contact IGPI program coordinator to obtain section number.*)

School of Library and Information Science

- SLIS:5200 (021:123) User Education: Multimedia (3 s.h.)
- SLIS:6100 (021:124) Database Systems (3 s.h.)
- SLIS:6270 (021:224) Electronic Publishing (3 s.h.)
- SLIS:6140 (021:226) Digital Environments (3 s.h.)
- SLIS:6380 (021:228) Hypertext Systems (3 s.h.)
- SLIS:6480 (021:272) Special Libraries (3 s.h.)
- SLIS:6490 (021:278) Information Policy (3 s.h.)

Applied Mathematics and Computational Science

- AMCS:5900 (22A:397) Seminar: Applied Mathematical and Computational Sciences (arr.)
- AMCS:7990 (22A:399) Reading and Research (arr.)

Genetics

- GENE:6170 (127:170) Bioinformatics (4 s.h.)
- GENE:5173 (127:173) Computational Genomics (3 s.h.)
- GENE:7191 (127:191) Human Molecular Genetics (3 s.h.)
- GENE:6200 (127:200) Special Topics in Genetics (1 s.h.)

College of Medicine

Pathology

- PATH:5270 (69:270) Pathogenesis of Major Human Diseases (3 s.h.)
Non-Departmental

- MED:8213 (50:183) Healthcare Ethics Law and Policy (3 s.h.)

College of Public Health

Biostatistics

- BIOS:5110 (171:161) Introduction to Biostatistics (3 s.h.)
- BIOS:5120 (171:162) Design and Analysis of Biomedical Studies (3 s.h.)
- BIOS:5310 (171:164) Research Data Management (3 s.h.)
- BIOS:6710 (171:230) Statistical Data Mining in Public Health (3 s.h.)
- BIOS:7210 (171:261) Survival Data Analysis (3 s.h.)
- BIOS:7410 (171:262) Analysis of Categorical Data (3 s.h.)
- BIOS:7310 (171:264) Longitudinal Data Analysis (3 s.h.)
- BIOS:6610 (171:266) Statistical Methods in Clinical Trials (3 s.h.)

Community and Behavioral Health

- CBH:6205 (172:106) Designing and Implementing Interventions (3 s.h.)
- CBH:5305 (172:181) Evaluation I: Theory and Applications (3 s.h.)
- CBH:5310 (172:183) Qualitative Research for Public Health (3 s.h.)
- CBH:6305 (172:282) Evaluation II: Design and Methods (3 s.h.)

Epidemiology

- EPID:5200 (173:120) Principles of Public Health Informatics (3 s.h.)
- EPID:4400 (173:140) Epidemiology I: Principles (3 s.h.)
- EPID:4450 (173:145) Public Health Data (3 s.h.)
- EPID:5500 (173:150) Introduction to Clinical Epidemiology (3 s.h.)
- EPID:5610 (173:161) Patient-Oriented Research Data Analysis (3 s.h.)
- EPID:6400 (173:240) Epidemiology II: Advanced Methods (3 s.h.)
- EPID:6600 (173:260) Epidemiology of Chronic Diseases (3 s.h.)
- EPID:6910 (173:291) Pharmacoepidemiology (3 s.h.)

Health Management and Policy

- HMP:4000 (174:102) Introduction to the U.S. Health Care System (3 s.h.)
- HMP:5350 (174:202) Hospital Organization and Management (1 s.h.)
- HMP:5310 (174:204) Quantitative Management in Health Care (2 s.h.)
- HMP:5315 (174:208) Health Services Information Systems (2 s.h.)
• HMP:5410 (174:212) Health Economics I (3 s.h.)
• HMP:5610 (174:243) Health Policy (3 s.h.)
• HMP:7960 (174:261) Analytical Issues in Health Services Research I (3 s.h.)
• HMP:7965 (174:262) Analytical Issues in Health Services Research II (3 s.h.)
• HMP:7150 (174:268) Health Care Utilization Outcomes (3 s.h.)

Occupational and Environmental Health

• OEH:4210 (175:111) International Health (3 s.h.)
• OEH:4150 (175:170) Injury and Violence Prevention (3 s.h.)
• OEH:4310 (175:190) Occupational Ergonomics I (3 s.h.)
• OEH:4240 (175:197) Global Environmental Health (3 s.h.)
• OEH:5620 (175:230) Occupational Health (3 s.h.)
• OEH:6420 (175:231) Industrial Hygiene Fundamentals (3 s.h.)