

DOCTORAL PROGRAM HANDBOOK 2015-2016

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BIOMEDICAL INFORMATICS

University of Nebraska Omaha

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Overview

This Handbook provides a summary of the essential elements of the doctoral BMI program. The Handbook is not a replacement for requirements specified in the graduate catalog, but instead helps to interpret and supplement them.

Students are subject to the requirements of the Office of Graduate Studies and the College of Information Science and Technology as detailed in the Graduate Catalog available through the Office of Graduate Studies Website at <http://www.unomaha.edu/registrar/catalog.php>.

Students should pay close attention to the paperwork and deadlines required by the Graduate Office, e.g., filing for candidacy and degree completion. It is the student's responsibility to file appropriate forms within the deadlines specified by the Graduate Office.

The doctoral BMI program requires 90 credit hours beyond a baccalaureate degree and consists of common required foundation/core courses to include doctoral seminars and colloquia, a major field of study, and a cognate field of study in a related discipline. The doctoral BMI program is divided into four phases from a student's perspective: foundation/core coursework, major-field-of-study/research coursework, additional elective coursework in an associated cognate-field-of-study (as advised by the student's supervisory committee), and doctoral research and dissertation.

Important Note: Undergraduate courses, either taken at UNO or at other universities will NOT count as credits towards the Ph.D. degree. Courses taken at UNO numbered 8**5 will NOT be counted as credit towards the Ph.D. degree.

Course Requirements

Core Courses

A maximum of 24 credit hours of graduate coursework can be transferred from courses taken in a graduate program prior to admission into the Ph.D. in BMI program at UNO. All such credit transfers must be approved by the doctoral program committee as part of the student's plan of study.

As part of the core course requirement, students must either take **BMI 8100 Introduction to Biomedical Informatics** for 3 credits or a GPC approved equivalent course.

Major Field of Study

18 hours selected from the list below or Shared Major-Field-of-Study courses. Coursework in the major field of study provides students the advanced study needed to develop an in-depth knowledge of their chosen field of research. At least 9 hours must be in 9000-level courses. The remaining courses should include at least 3 hours from 8000-level graduate-only courses, and at most only 6 hours of cross-listed 8xx6 courses.

Bioinformatics Track

BMI 8866	Bioinformatics Algorithms
BMI 8896	Genetic Sequence Analysis
BMI 9050	Advanced Algorithmic Graph Theory
BMI 9200	Advances in Biomedical Technology
BMI 9900	Advanced Research in Biomedical Informatics
CSCI 8156	Graph Theory and Applications
CSCI 8456	Introduction to Artificial Intelligence
CSCI 8876	Database Search and Pattern Discovery

Health Informatics Track

BMI 8400	Clinical Systems Architecture and Function
BMI 8500	Readings in Clinical Informatics
ISQA 8060	Research Methods in Management Information Systems
ISQA 8106	Information Systems Architecture and Organization
ISQA 8196	Process Re-engineering with Information Technology
ISQA 8220	Advanced Systems Analysis and Design
ISQA 8736	Decision Support Systems
ISQA 8810	IT Project Management

Shared Major-Field-of-Study

BMI 8080	Seminar in Biomedical Informatics
BMI 8300	Public Health Genomics
BMI 8850	Biomed for Nonmedical Professionals
BMI 9980	Independent Research in Biomedical Informatics
CIST 9900	Seminar: Human-Computer Interaction Research
ISQA 8410	Database Management
ISQA 8700	Data Warehousing Theory and Practice

ISQA 9020	Technical and Processing Issues in Information Systems
ISQA 9030	Behavioral and Organizational Issues in Information Systems

Research

18 hours required for all students from the list below:

CIST 9080	Research Directions in Information Technology
ISQA 8156	Advanced Statistical Methods for IT
ISQA 8160	Applied Distribution-Free Statistics
ISQA 8340	Applied Regression Analysis
ISQA 9010	Foundations of Information Systems Research (Required)
ISQA 9120	Applied Experimental Design
ISQA 9130	Applied Multivariate Analysis

Cognate Field

9 hours from graduate courses (8000 or higher) in the areas of Biology, Information Systems and Quantitative Analysis, Information Assurance, Neuroscience, Public Health, Computer Science, or Pathology, determined with faculty advisement.

Colloquia

3 hours required for all students from the list below. They are offered consecutively during one semester:

CIST 9040	Colloquium on IT Research (1 hour)
CIST 9050	Colloquium on IT Teaching (1 hour)
CIST 9060	Colloquium on IT Profession (1 hour)

Dissertation

The dissertation is an original research project conducted and written under the direction of the faculty dissertation committee (supervisory committee). A minimum of 18 hours from the list below:

CIST 9990	Dissertation
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Independent Research Courses

Doctoral students can take the independent study course **BMI 9980 Independent Research in BMI** for 1-3 credit hours to gain specific knowledge in an area not covered by a regular graduate course. A UNO faculty member must supervise all such independent study courses. Independent study courses usually do not have regular meeting times or lectures like conventional courses. They are primarily self-study, research-oriented courses facilitated by meetings between the student and the supervising faculty member.

Independent Research Course Approval

In the semester preceding the one during which the independent research course will be taken, the student and the supervising faculty member must submit an independent study proposal form to the doctoral program committee chair for review by the doctoral program committee. After the doctoral committee approves the independent study proposal, the student can register for the independent study course. Students are not allowed to register for two different independent study courses under the same faculty member during the same semester.

Independent Research Grades

The faculty member supervising the independent research should submit the grade for the student via email to the doctoral committee chair before the end of the semester. Independent study courses extending beyond one semester can be given an IP (in progress) grade by the supervising faculty member.

Normally there is no time limit for graduate students to remove an incomplete. However, the instructor does have the option of determining the requirements for completing the course and requisite date for removal of incompletes. It is helpful to have these requirements in writing to ensure there is no miscommunication between the instructor and student.

Special Topics Courses

Special topic courses are designed to acquaint students with issues current to the field or emerging trends, and are similar to conventional courses with regular, weekly meeting times. Special topics courses must be approved by the doctoral program committee before scheduling by the faculty member offering the special topics course.

College Round Tables

The College of IS&T hosts regular research presentations by faculty, researchers and industry professionals. These sessions give students an opportunity to network with researchers, become familiar with a variety of topics and research methods, and expose their own ideas in discussion with presenters. **Students are expected to attend these round table meetings, and attendance will be taken.**

Round table presenters often have separate meetings with graduate students, and doctoral students should plan to attend these meetings in addition to the actual round table presentation.

Quality of Work Requirement

In addition to maintaining a GPA of 3.0 or better in all course work, doctoral students must obtain a grade of B or better in any of the required courses. Any student failing grade requirements will be prevented from taking the comprehensive examination and/or dismissed from the program.

Automatic Dismissal

Graduate students are expected to do work of high caliber. Failure to do so will result in dismissal. In particular, the following will result in automatic dismissal from the degree or certificate program:

- Receiving a grade of "C-" (1.67 on a 4.0 scale) or below in any course taken in the student's major field of study or in any course included in the plan of study or program of study;
- The Doctoral Committee may, under some circumstances, recommend dismissal of a student from the graduate program even though quality of work standards have been maintained. Grounds for dismissal could include, but are not limited to:
 - failure to be accepted by an appropriate thesis or dissertation adviser within stipulated time limitations;
 - failure to make timely progress toward the degree or certificate;
 - failure to perform in course work, qualifying examination or research at an acceptable level

Probation or Dismissal

The Doctoral Program Committee will recommend that the Dean for Graduate Studies either dismiss, or place on probation with conditions for reinstatement as a student in good standing, in the following cases:

- A Grade of "C+" (2.33 on a 4.0 scale) or below in any course involved in the first 12 hours of graduate study for provisionally admitted students;
- Receiving at least nine hours of graduate credit with the grade of "C+" (2.33 on a 4.0 scale) or below in any courses taken in the student's major field of study or in any

courses included in the plan of study for master's or specialist's degrees or graduate certificates, regardless of the average;

- Receiving at least six hours of graduate credit with the grade of "C+" (2.33 on a 4.0 scale) or below in any courses taken in the student's major field of study or in any courses included in the program of study for doctoral degrees, regardless of the average;
- Failure to maintain a "B" (3.0 on a 4.0 scale) average in all graduate work taken as part of the degree or certificate program.

Residency Requirement

All full-time doctoral students must complete 24 hours within 18 months in order to meet the residency requirement of the University. Part-time students must complete 18 hours during the same period. The residency requirement ensures that progress toward the degree occurs within a reasonably compact time frame, enabling the doctoral student to integrate their course work with the dissertation.

Teaching Requirement

All Ph.D. students are required to teach at least ONE course/lab while studying in the program. Students who are assigned to teach a course will be designated as the instructor for a section of the course, and will be trained and evaluated by a mentor before teaching the course.

Method of Allocation:

The steps to being allocated as a teaching assistant for a course are:

- The student will inform the DPC chair about the plan to teach a course along with a list of preferred courses.
- If the student is teaching a course for the first time, this information should be sent TWO semesters before the semester in which the planned course is intended to be offered.
- If the student has taught the course in the past, this information should be sent ONE semester before the semester in which the planned course is intended to be offered.
- The DPC chair will consult with the unit chairs responsible for course scheduling to determine the need of instructors for different courses to make a suitable allocation.
- The student will undergo mentorship under the faculty member responsible for teaching the course by attending the lectures and doing additional duties as determined by the mentor, ONE semester BEFORE the semester in which the planned course will be offered.

The student will be assigned as an instructor for the planned course, if, after undergoing the mentorship, the mentor determines the student is suitable for teaching the course.

Progress Report

At the end of each semester, every doctoral student (full-time or part-time) must complete the Progress Report Form and submit it to the Director of the Doctoral Committee. An electronic copy of this form is available on the PhD Website at <http://www.unomaha.edu/college-of-information-science-and-technology/phd-it/current-students/forms.php>.

Time Limit for Completion of Degree

A minimum of three full years of graduate study is normally required to complete a program for the degree of Doctor of Philosophy. The time limit on granting the PhD degree is ten years from the time of filing the student's program of study in the Office of Graduate Studies. Neither the courses taken nor the time spent in study determines the granting of the degree. It is given primarily for high attainment in some special field of scholarship and for demonstrated power of independent research in a subdivision of this field. **Students not making satisfactory progress will be counseled out of the program.**

Leave of Absence

Under extraordinary circumstances, e.g., medical problems, a student may request a leave of absence from the program for a period of no more than one year. The request must be submitted to and approved by the student's supervisory committee and/or Doctoral Program Committee. The request should include necessary modifications to the Plan of Study as a result of the leave. The leave of absence stops the clock for the total time required for the program and the time required to meet the residency requirement. If a student withdraws mid-semester and is approved for a leave of absence, the clock starts at the beginning of the following semester. A student does not have to meet the residency requirement in order to apply for a leave of absence. If a student does not return to the program within the one year approved leave of absence, then the student must submit an application to reapply to the program. Readmission to the program is not guaranteed at that point. Please refer to the UNO Graduate Catalog for the complete policy on a leave of absence.

Supervisory Committee

For each doctoral student, the Dean of Graduate Studies will appoint a supervisory committee (also called the Formal Dissertation Committee).

The supervisory committee:

- Shall be formally established after completing at least 18 credit hours of course work or before a doctoral student begins the last 45 credit hours of their program of study (whichever comes first) in the doctoral program.
- Shall have responsibility for the planning and supervision of the student's doctoral program in coordination with the BMI Doctoral Program Committee, including the development of the comprehensive exam, defense of the doctoral dissertation proposal, approval of the completed dissertation, and the final oral examination.
- Shall have at least four Graduate Faculty members, one of whom must be from outside the student's academic department/school or area in which the doctorate is to be granted. The chair of the supervisory committee must be a member of the Graduate Faculty. In addition to the minimum requirement of four Graduate Faculty members, other eligible persons may be recommended by the Doctoral Program Committee for appointment by the Dean to the supervisory committee, provided at least two-thirds of the membership of each committee is Graduate Faculty.
- Shall be regulated in their responsibilities, procedures, and actions by the rules and bylaws of the UNO Graduate College as established in the UNO Graduate Bulletin.
- Shall meet within the same semester of its appointment to designate and subsequently file in the Office of Graduate Studies a complete program of studies, including any language or research tool requirements (if applicable), and reading committee. The reading committee consists of two members from the supervisory committee, excluding the chair of the committee.
- Shall approve any subsequent change in the Program of Study or in the dissertation topic, and recommend it to the Dean of Graduate Studies.
- Can be changed after formation by submitting a new Appointment of Supervisory Committee form. All members of the former supervisory committee must be informed of the change in the membership of the committee

Admission to Candidacy Requirements

Students will follow the general candidacy requirements for the UNO Graduate College. Admission to the doctoral program does not necessarily imply admission to candidacy for a higher degree.

To be admitted to candidacy for the doctorate degree, a doctoral student must:

- Successfully complete all coursework with satisfactory grades
- Pass the comprehensive written and oral examinations
- Receive supervisory committee approval of their dissertation proposal

Comprehensive Examination

The comprehensive examination can be taken after the student has completed all course work according to his or her plan of study and formed a supervisory committee. The comprehensive exam consists of a written part that tests the breadth of a student's knowledge, and an oral part that tests the depth of a student's knowledge.

- ***Breadth Component***

Before taking the written part of the exam, students will provide a selection of 3-4 topics from the areas covered in the **BMI 8100 Introduction of Biomedical Informatics** course. The selected topics should not have significant overlap within the major area of study given in the student's plan of study. The topics should be selected so that they express a breadth in the areas in the core disciplines of Biomedical Informatics. The doctoral program committee will identify two topics from the set of topics selected by the student and inform the student in advance of the exam. The material related to the topic for preparing for the comprehensive exam (e.g., paper reading list) will already have been provided to the student when the student took the BMI 8100 course. Questions on the selected topics may be set by the faculty presenter(s) of the topic in BMI 8100. Answers will also be evaluated by the topic's presenter(s), either individually or by a group of faculty members selected by the topic's presenter(s). Alternatively, the DPC may decide on who sets and evaluates the exam.

- ***Depth Component***

For the depth examination, the student will prepare an NSF or NIH grant style research proposal and defend it. This exercise is called a research proposal, not a thesis proposal. The proposal will cover the expected thesis area, but it is not inconceivable that the thesis will eventually be on another topic.

The depth exam cannot be taken without successfully passing the breadth exam. The purpose of the depth exam is to make students thoroughly familiar with the theory behind the techniques that they will use; to give them a complete grounding in the literature of their research field (current and historical); and most importantly, to get them to think about their research. After writing the proposal, the student will orally defend the proposal (which must be no later than the end of

the **student's fifth semester**). During the oral defense student is examined about background and methods used in the proposed work.

At the proposal defense, the student presents an overview of proposal orally. Since all committee members have read the proposal prior to the defense, the oral presentation will consist of 20-30 minutes long presentation by the student. Students are asked to answer a series of questions related to the proposal material. At the end of the proposal defense, students are asked to briefly leave the room and the committee discusses the proposal defense. When the committee members reach a decision, students are asked to return to the room.

After the defense, if the defense is satisfactory students will receive either

- a clear pass (no other action is required on the part of the student)
- a conditional pass (additional action is required on the part of the student).

Conditional passes are given if the committee finds there is an area that still needs to be addressed by the student. For example, if a student is deficient in a specific area that the committee feels will be important for the student's success in the Ph.D. program, they might require the student take an additional course. Re-writing a section of the grant proposal to clarify/correct a point that wasn't clear in the original version is another common condition that can be assigned to students receiving a "conditional pass".

Application for Admission to Candidacy

After the student has met all requirements for candidacy, the supervisory committee will recommend their candidacy for the doctoral degree to the Office of Graduate Studies through submission of the signed *Application for Admission to Candidacy* form. The recommendation will note the dates of completion of the comprehensive exam. Such a recommendation must be filed at least **seven months** prior to the final oral examination for defending the student's dissertation in the presence of their supervisory committee. A student is formally recognized as a candidate as of the date of completing the comprehensive exam.

Following admission to candidacy, the student must register during each academic semester until they receive the doctorate degree. Students not in residence may register for a minimum of one semester hour credit in dissertation. Failure to register during each academic semester will result in termination of candidacy.

The term of candidacy is limited to three years. If the term of Candidacy is extended beyond three years (excluding summer terms), the Candidate must pass another comprehensive examination.

Dissertation and Final Examination

The dissertation should treat a subject in-depth from the candidate's major field of study/research area and as approved by the supervisory committee. The student's dissertation should indicate technical mastery of the field and create original material through advancing or modifying knowledge, creating new material, finding new results, drawing new conclusions, or interpret old material in a new light.

If the dissertation proposal is approved, the student may conduct the dissertation research under the guidance of the dissertation advisor. The student is advised to consult informally and continuously with his/her supervisory committee until the committee accepts the dissertation. After the dissertation research is completed, the dissertation document and/or product must be presented to all the members of the supervisory committee in time to permit review and approval, and the manuscripts must be turned in at least thirty days in advance of the final oral examination over the dissertation. The dissertation will be defended at an open meeting of the faculty, conducted by the student's supervisory committee.

Dissertation Credits

The dissertation of a Ph.D. candidate is supervised by the chair or co-chairs of the student's supervisory committee in consultation with other members of the supervisory committee. While completing the dissertation, the candidate should enroll in course ***BMI 9990 Dissertation in BMI***. A minimum of 18 hours is required for graduation. Dissertation course credits should be taken only after the doctoral student advances to candidacy. Under special circumstances, doctoral students can take dissertation credits during the semester they apply for candidacy, but the dissertation credits taken under these circumstances should be kept to a minimum. Dissertation credits cannot be taken if the student does not pass the written part of the comprehensive exam.

IMPORTANT NOTE: The Graduate College requires a minimum of **seven months** to elapse between the date of the doctoral student's advancement to candidacy and the date of dissertation defense.

Scheduling Dissertation Defense

When the supervisory committee deems it appropriate for the Ph.D. candidate to defend their dissertation, the Ph.D. candidate prepares a dissertation thesis and submits it to the supervisory committee members. When submitting the dissertation thesis to the supervisory committee, the candidate should also submit a final oral exam form to the Office of Graduate Studies. The final oral exam form requires the signatures of the supervisory committee members and the doctoral program committee chair, and should be submitted at least **four weeks** before the desired date of the dissertation defense. Supervisory committee members should sign this form after receiving the final draft of the dissertation.

IMPORTANT NOTE: Before scheduling the dissertation defense, students should refer to the Office of Graduate Studies website at <http://www.unomaha.edu/graduate-studies/current-students/doctoral-dissertation.php> for instructions on submitting their

dissertation to ProQuest, graduation checklist, thesis filing deadlines and commencement dates for the semester in which they plan to graduate.

Completing Graduation Requirements

After successfully defending his or her dissertation, the student should complete a *Report on Completion of Degree* form <http://www.unomaha.edu/graduate-studies/files/report-completion-degree-form.pdf> and apply for graduation through Mavlink.

Reviews:
DPC reviews of page 11-12 (comprehensive exam)