College of Health Solutions

ARIZONA STATE UNIVERSITY

Department of Biomedical Informatics

GRADUATE HANDBOOK
Academic Year 2016/2017

Master of Science (MS) in Biomedical Informatics
Doctor of Philosophy (PhD) in Biomedical Informatics

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Department of Biomedical Informatics: Student Handbook

This handbook is a guide for graduate students admitted to the Department of Biomedical Informatics (BMI). Each student should consult the handbook for information about the M.S. and Ph.D. degrees in BMI.

The handbook is provided as an initial resource for answers to questions about the program, but students are also encouraged to consult with the Graduate Coordinator, their Faculty Advisor, or the Academic Program Director. The primary reference for graduate students on rules and regulations is the Arizona State University Graduate Education website: https://graduate.asu.edu/key-policies.

This handbook describes requirements for students admitted for Fall 2016. Once admitted to the BMI graduate program, students have access to the BMI Graduate Student Blackboard site, where they will be able to find many of the materials in this handbook. Admitted students can access the site through MyASU at https://my.asu.edu/.

Graduate Education requirements define the basic policies for obtaining a degree from ASU, these policies can be found on the ASU Graduate Education Website located here: https://graduate.asu.edu/sites/default/files/asu-graduate-policies-and-procedures.pdf. BMI has several additional requirements, beyond the standard ASU policies, which are identified in this handbook.

Biomedical Informatics

Biomedical informatics is an interdisciplinary research field that focuses on collaborating among computer scientists, cognitive, social and decision scientists, engineers, mathematicians, biologists and clinicians. These collaborations leads to advancements in information technology, data and knowledge management and analysis methodologies to improve our understanding of health care practice, public health and biological systems. The goal of this research is to enhance patient care and overall human health by expediting the process of transferring basic biomedical research to clinical use effectively and safely. Graduate Degrees Offered assistantships are primarily reserved for PhD candidates.

Student Responsibility

It is our expectation that all students enrolled in Biomedical Informatics will observe the policies expressed in this handbook as well as the academic policies of Arizona State University. Above all, we expect each student to maintain a high level of academic integrity. Each student must act with honesty and integrity, and must respect the rights of others in carrying out all academic assignments. The policies that our program abides by include the student academic integrity policy, the student code of conduct and the misconduct in research policy of ASU. We require students to review and observe these policies described in the Board of Regents Policy Manual available online at: https://www.azregents.edu/board-committees/policy-manual.

Other information concerning administrative procedures and university policies can be viewed online at: http://www.asu.edu/aad/manuals/sta/.

We expect our students to be accountable for any and all of the policies defined above. Violations of a Graduate Education, Biomedical Informatics or Arizona State University policy will result in academic review and may consequently result in student disciplinary procedures.

Academic Integrity

Graduate students are expected to be ethical in their multiple roles as students, researchers, teachers or supervisors of undergraduate students, and representatives of the Department and University. When in doubt about appropriate conduct, students should consult a faculty mentor to seek clarification. Breaches of academic integrity include, but are not limited to, the following:

- Engaging in any form of academic deceit, e.g., referring to materials, sources, or devices (camera phones, text messages, crib sheets, solution manuals, materials from previous classes, or commercial research services) not authorized by the instructor for use during an evaluation or assignment;
- Providing inappropriate aid to another student in connection with any evaluation or assignment;
- Engaging in plagiarism by using the ideas, words, or data of another person or persons without full and appropriate attribution;
- Engaging in plagiarism by claiming credit for the ideas, words, or data of another person or persons, or submitting work done by another as one's own;
- Failing to follow ethical procedures for research involving human subjects, such as violating participants' confidentiality, or failing to maintain confidential or sensitive research data in a secure location;
- Knowingly using data that do not meet appropriate standards for reliability and validity;
- Failing to meet responsibilities to undergraduate students, such as failing to provide assistance during designated office hours;
- Engaging in a romantic relationship with an undergraduate student whom you supervise or evaluate in a classroom or research setting;
- Falsifying or misrepresenting hours or activities in relationship to an internship, externship, research assistantship, field experience, workshop, or service learning experience;
- Repeatedly failing to meet commitments and responsibilities, such as chronically missing deadlines, or failing to provide work promised to colleagues; and
- Behaving in a way that reflects poorly on the School, Institute, and University while conducting research or participating in community activities as a representative of the School.

The Department of Biomedical Informatics has a zero-tolerance policy for any form of academic malfeasance. Penalties for unethical behavior range from being placed on academic probation to dismissal from the program. Additional information about academic integrity policies of the University is available on the Student Rights and Responsibilities web site at http://provost.asu.edu/academicintegrity. Graduate Education information regarding academic integrity is available on the Academic Integrity web site at https://graduate.asu.edu/beintheknow.

Additionally, all new students are required to complete the Academic Integrity Module, which is available for students on Blackboard (*ASU Academic Integrity Module Training*). Students must register for this course in Blackboard, review the presentation, and complete the Quiz by **September 1st, 2016**, with a passing score of 80% or higher. An additional reminder should be listed in MyASU under the priority task list. The Graduate Coordinator will be reviewing the course records to ensure all graduate students have completed the academic integrity modules successfully.

Sexual Harassment

The University prohibits sexual harassment by employees and students and will not tolerate sexual harassment that interferes with an individual's work or educational performance or creates an intimidating, hostile, or offensive working, learning, or residential environment. Additional information can be found at https://www.asu.edu/aad/manuals/acd/acd401.html.

Campus Safety

To report an emergency on campus, students can simply dial 911 or use one of the emergency call boxes found on campus. Non-emergency ASU Police or campus-safety matters should be directed to 480-965-3456. ASU has an opt-in, text-message alert system by which students can choose to receive a text message from ASU in times of an emergency. For safety resources and contacts, such as Counseling Services, Police, and Safety Escort Services, visit https://eoss.asu.edu/dos/Safety.

Facilities

ASU has a large and diverse graduate student body. More than 12,000 students from 140 countries choose ASU to pursue their graduate degrees. The university has excellent library and laboratory facilities, as well as outstanding computing infrastructure, all of which foster a stimulating and supportive environment for graduate education and research.

Tuition and Fees

Students can find up to date information on tuition and fees at: http://students.asu.edu/tuitionandfees

BMI Faculty

BMI faculty can be found at https://chs.asu.edu/programs/schools/department-biomedical-informatics/directory?dept=7644&query=*:*.

Financial Support

Students seeking financial support should ask their Faculty Advisor about available research news about fellowships and awards, and employment possibilities

Applicants to the PhD program will automatically be considered for funding available through BMI at the time their applications are reviewed.

BMI aims to provide financial support opportunities for its students, but admittance into the program is not a guarantee of funding. Not all students will receive financial support through BMI.

Students should also visit the Graduate Education web site and other links for student funding resources:

- The ASU Financial Aid Office: http://students.asu.edu/financialaid
- Finance Your Education: ASU Resources: http://graduate.asu.edu/financing
- National Science Foundation Graduate Research Fellowship Program: http://www.nsf.gov/grfp
- National Institutes of Health Grants: http://grants1.nih.gov/grants/index.cfm
- National Research Service Award (NRSA) Research Training Grants and Fellowships: http://grants.nih.gov/training/nrsa.htm
- Federal Student Aid (Student Loans): http://www.fafsa.ed.gov/
- Working at ASU: http://students.asu.edu/employment

Additional University Resources

MyASU: https://webapp4.asu.edu/myasu/
Bookstore: http://bookstore.asu.edu/asu/home.aspx
Campus Health Services: http://www.asu.edu/studentaffairs/health/
Career Services: http://www.asu.edu/studentaffairs/career/
Counseling and Consultation: https://eoss.asu.edu/counseling
Disability Resource Center (DRC): http://www.asu.edu/studentaffairs/ed/drc/
Graduate Office (Admissions): https://students.asu.edu/graduate
Graduate Education – Current Student Academic Resources: https://graduate.asu.edu/
Graduate Education - Format Evaluation: https://graduate.asu.edu/sites/default/files/cdpm/how-to-format-review.pdf
Graduate and Professional Student Association: http://www.asu.edu/gpsa/
Graduation Office (Registrar): http://students.asu.edu/registration
International Student Office: https://global.asu.edu/international-student-and-scholars-center
Parking and Transit Services: http://pts.asu.edu/
Records (Academic): http://students.asu.edu/student-records-grades
Residency: http://students.asu.edu/residency
Scholarship Office: https://students.asu.edu/scholarships
Student Accounts: http://www.asu.edu/sbs/
Student Employment: http://students.asu.edu/student-employment
Student Financial Assistance: http://students.asu.edu/financial-aid
Student Recreation Complex: http://src.asu.edu/
Sun Card Office: https://cfo.asu.edu/cardservices-suncard
Sun Devil Ticket Office: http://thesundevils.com/
Testing Services, University: http://www.asu.edu/uts/
University Technology Office: http://uto.asu.edu/

ASU Graduate Education Requirements

Graduate Education requirements define the basic policies for obtaining a degree from ASU.

Satisfactory Academic Progress

GPA (Grade Point Average) Graduate students must maintain a minimum 3.00 grade point average (GPA) to maintain satisfactory academic progress and to graduate. The minimum 3.00 GPA must be maintained on all GPA's (Plan of Study (iPOS) GPA, Overall Graduate GPA and Cumulative GPA)

- The iPOS GPA is calculated on all courses that appear on the student's approved iPOS (with the exception of LAW and Transfer credits)
- Cumulative ASU GPA represents all courses completed at ASU.
- The Overall Graduate GPA is based on all courses numbered 500 or higher that appear on the transcript after admission to a graduate program or graduate non-degree. This includes shared coursework if in an approved accelerated bachelor's/master's program.

Courses with grades of "D" (1.00) and "E" (0.00) cannot appear on the iPOS but will be included when calculating the Graduate GPA. Courses with an "I" grade cannot appear on the iPOS.

All graduate students are expected to make systematic progress toward completion of their degree. This progress includes satisfying the conditions listed below, and achieving the benchmarks and requirements set by the individual degree programs as well as Graduate Education. If a student fails to satisfy the requirements of their degree program and/or the benchmarks outlined below, the student may be dismissed from their program based on the academic unit's recommendation to Graduate Education at which time the Vice Provost for Graduate Education makes the final determination.

Note: ASU Graduate Education requirement for Satisfactory Academic Progress, does not meet the minimum departmental requirements (see BMI grade requirements, page 12).

These as well as all other Graduate Education policies can be found in the ASU Graduate Policies and Procedures:

1. Maintain a minimum 3.0 for all GPA's.
2. Satisfy all requirements of the graduate degree program.
3. Satisfy the maximum time limit for graduation from the student's graduate degree program (six years for masters, ten years or five years from comprehensive exams (whichever comes first); for doctoral, see "Time to Degree" section.
4. Successfully pass comprehensive exams, qualifying exams, foreign language exams, and the oral defense of the proposal/prospectus for the thesis or dissertation.
5. Successfully complete the culminating experience.
6. Graduate students must remain continuously enrolled in their degree program. Failing to do so without a Graduate Education approved request to

Maintain Continuous Enrollment is considered to be lack of academic progress.

Continuous Enrollment

Once admitted to a graduate degree program or graduate certificate program, students must be registered for a minimum of one graduate credit hour during all phases of their graduate education (fall and spring, summer if utilizing university resources in any way as listed below), including the term in which they graduate.

Students are:

- engaged in research
- conducting a doctoral prospectus
- working on or defending theses or dissertations
- taking comprehensive examinations
- taking Graduate Foreign Language Examinations
- Grades of "W" and/or "X" are not considered valid registration for continuous enrollment purposes.

Receiving a grade of "I," you must maintain continuous enrollment. To maintain continuous enrollment, the credit hour(s) must appear on the student's iPOS OR be a graduate-level course. Graduate students planning to discontinue registration for a semester or more must submit the Maintain Continuous Enrollment request. This request must be submitted and approved before the anticipated semester of non-registration. Students may request to maintain continuous enrollment without course registration for a maximum of two semesters during their entire program.

Pre-Admission Credits

Credit hours completed at ASU or from another regionally accredited US institution or international institution officially recognized by that country, before the semester and year of admission to an ASU graduate degree program, are considered pre-admission credits. With the approval of the degree program and the Graduate Education office, students may include a maximum of 12 graduate-level credit hours with grades of "B" or better that were not used towards a previous degree. Preadmission credits must have been taken within three years of admission to the ASU degree program to be accepted.

Accelerated Bachelor's/Master's programs may use a maximum of 12 pre-admission credits which may include up to a maximum of 12 hours shared between the Bachelor's and Master's program. Students in accelerated programs should contact their Graduate Coordinator to ensure proper sharing of credit hours. Official transcripts must be sent to Graduate Admission Services from the records office of the institution where the credits were earned.

Time to Degree Limit

Master's students: All work toward a master's degree must be completed within six consecutive years.

Doctoral Students: Doctoral students must complete all program requirements within ten consecutive years or five years from passing comprehensive exams (whichever comes first).

Note: ASU Graduate Education requirement for Time to Degree Limit, does not meet the minimum BMI departmental requirements (listed under *Time Limit*).

Department of Biomedical Informatics Requirements

For Both Master's and PhD students

Deficiency Coursework

Deficiency course work must be completed with a B or higher by the term indicated in their admission letter. If a student believes that an assigned deficiency course(s) has been completed at another institution, or if substitutions will be made to assigned deficiencies, the student must obtain approval from the Faculty Advisor. Approval is sought by submitting a Course Deficiency Evaluation Application. If approved by the Faculty Advisor, the form is submitted to the Graduate Coordinator.

Pre-Admission Credits

Requests for transfer credits will be reviewed on a case-by-case basis by the Academic Programs Committee (APC) and in accordance with Graduate Education policy. Students must submit a proposal to the BMI Graduate Coordinator including a list of courses for which Pre-admission credit is sought. The proposal should include a description of each course that includes course outcomes and how they relate to BMI along with the student's plan of study for the BMI degree. The Graduate Coordinator will work with the Academic Programs Committee (APC) to consider the coursework for Pre-admission credit in light of the student's area of interest and their Plan of Study.

The taking of courses for graduate credit as an undergraduate or non-degree student does not ensure admission to the program or acceptance of the acquired graduate credit hours as part of the Plan of Study.

Plan of Study

The Plan of Study (iPOS) is a formal plan to meet degree requirements. The iPOS is an agreement that the work specified on the iPOS will be sufficient for the desired degree.

Students should strive to submit the iPOS online by the end of their first semester (MS students) or second semester (PhD students) and are required to submit it when 50% of the minimum credit hours for the degree being pursued have been completed.

A Plan of Study (iPOS) must be filed online via MyASU with Graduate Education. It includes all courses to be taken, Faculty Advisor/Chair, and for PhD students a list of supervisory committee members. An approved Plan of Study must be on file before a student can register for a final culminating experience (BMI 593 Applied Project, BMI 799 Dissertation) or schedule their comprehensive exam.

Change of Faculty Advisor

If a change of Faculty Advisor is desired, the student will need to change the advisor listed on their iPOS. Once the student has updated the advisor section of the iPOS,

the student will need to print their Plan of Study and obtain signatures of approval from the old advisor and the new advisor (for PhD students, student must submit the Supervisory Committee Change form - with signatures from the old and new committee members). The signed iPOS should be submitted to the Graduate Coordinator for review and approval, then subsequent routing for auditing by the Graduate Education.

Change of Coursework
If a student would like to change the coursework listed on the Plan of Study, the student will need to change the coursework listed on their iPOS. Once the student has updated their coursework, they will need to print their updated Plan of Study and obtain signatures of approval from the Faculty Advisor (and supervisory committee members, for PhD students). The signed iPOS should be submitted to the Graduate Coordinator for review and approval, then subsequent routing for auditing by the Graduate Education.

Change of Supervisory Committee
For PhD students: If a change of supervisory committee member(s) is desired, the student will need to submit the Supervisory Committee Change Form (with signatures from the old and new committee members) and change the supervisory committee member(s) listed on their iPOS. If a faculty member has been chosen who is not on the approved list, the student must submit a *Committee Approval Request* to the Graduate College before they can change their iPOS. Once the student has updated the supervisory committee section of the iPOS, the student will need to print their Plan of Study and obtain signatures of approval from the Faculty Advisor and supervisory committee members. The signed iPOS should be submitted to the Graduate Coordinator for review and approval, then subsequent routing for auditing by the Graduate Education.

Courses Requiring Department Consent
The following courses require department consent for registration:

- BMI 590/790 Reading and Conference
- BMI 584 Internship
- BMI 560 Teaching Assistantship
- BMI 593 Applied Project
- BMI 792 Research
- BMI 799 Dissertation

Students must complete the required BMI course registration form, and submit to the instructor for approval, before the student will be eligible for registration.

Completed forms must be filed with the Graduate Coordinator to receive the override necessary to register in these courses. Students must be in Good Academic Standing to register in any course that requires department consent.

Elective Courses
After satisfying pre-requisites and co-requisites, students must select elective courses from the Pre-Approved Electives List. Electives should be chosen in

consultation with the student's Faculty Advisor or for PhD students the Supervisory Committee (if the student has determined the Supervisory Committee).

Electives other than those on the BMI pre-approved elective list can be approved for inclusion on a student's iPOS if the elective is integral to the student's program of research. Students may make a request to their Faculty Advisor and the Academic Program Director.

BMI Electives: Pre-Approved
(MS students must take a minimum of 6 credits of BMI Electives)
(PhD students must take a minimum of 15 credits of BMI Electives)

BMI 506/BMI 616: Clinical Decision Support
BMI 507: Introduction to Digital Image Processing & Analysis
BMI 515: Advanced Biostatistical Methods* (required for PhD)
BMI 550: Translational Bioinformatics
BMI 555: Statistical Learning for Data Mining
BMI 591: Topic: Public Health Informatics
BMI 591: Topic: NLP for Biomedical Text Mining
BMI 591: Topic: NIH Grant Writing
BMI 591: Topic: Data Mining
BMI 591: Topic: Image Analytics & Informatics
BMI 591: Topic: HCI and Human Factors in Biomedicine
BMI 591: Topic: Clinical Application Development
BMI 608: Project Management for Interdisciplinary Teams

Additional Non-BMI Electives: Pre-Approved

APM 504: Applied Probability and Stochastic Processes
APM 598: Topic: Math Methods for Complex Adaptive Systems
BIO 598: Topic: Evolutionary biology of parasites and pathogens
CSE 412/598: Topic: Database Management
CSE 572: Data Mining
CSE 591: Topic: Machine Learning
GIS 598: Topic: Location and analysis modeling
IEE 505: Information Systems Engineering
IEE 520: Statistical Learning for Data Mining
IEE 547: Human Factors Engineering
IEE 572: Design of Experiments
LIN 514: Syntax
STP 598: Topic: Bayesian Statistics
STP 530: Applied Regression

All Students must have prior approval before including electives on their iPOS.

The following procedure should be followed by students who wish to take outside electives:

1. The student should prepare a written request which includes:
    a. A description of the course;
    b. The objectives of the course;
    c. How the course enhances the ability of the student to conduct research.
2. This request should be approved by the student's Faculty Advisor.

3. The request would then be forwarded by email to the Academic Program Director two weeks before the start of the semester.
4. If the Academic Program Director approves the elective, the approval will forwarded to the Graduate Coordinator.

Grade Requirements

All students must comply with the ASU Graduate Education requirements for maintaining satisfactory progress. Additionally, BMI students must obtain a B or better in all BMI core courses. If the core course grade requirement is not met, the default procedure is for students to re-take the deficient course (or courses).

Note: If a student has to retake a course to meet the minimum requirement (B or better), the grade will NOT be replaced on the official ASU transcript. Both courses will be recorded on the graduate transcript and calculated for GPA purposes, per Graduate Education policy.

Students will not be able to register for milestones (BMI 593 Applied Project, BMI 799 Dissertation, or schedule their comprehensive exam), until the grade requirement has been met.

Incomplete Grades

Students have up to 1 calendar year in which to complete a course that was designated as incomplete (I). Ultimately the timeframe for completion is determined by the instructor, in conjunction with the student. Once coursework has been fulfilled, a grade will be assigned. If the student does not complete coursework within one calendar year, the incomplete will become permanent and the student will have to re-take the course if it is a required course.

Grades

The Graduate College assigns a general grading policy for all students attempting a graduate degree. Grades are assigned as follows:

Grade	Graduate Definition	Value
A+		4.33
A	Excellent	4.00
A–		3.67
B+		3.33
B	Good	3.00
B–		2.67
C+		2.33
C	Passing	2.00
D	No Graduate Credit	
E	Failure	0.00*

Grade	Graduate Definition
W	Withdrawal**
I	Incomplete
X	Audit
Y	Satisfactory
Z	Course in progress***

*This grade cannot be applied to a graduate degree but is included in the calculation of a grade point average.

**This grade is given whenever a student officially withdraws from a class.

***This grade is usually given pending completion of courses such as research, thesis, dissertation or practicum. All grades of “Z” must be changed to “Y” before graduation.

A grade of "P" (pass) in a 400 or higher level course may not appear on a Plan of Study. Grades of "D" or "E" cannot be used to meet the requirements for a degree although they are used to compute the grade point averages. A student receiving a grade of "D" or "E" must repeat the course in a regularly scheduled (not an independent study) class if it is to be included in the Plan of Study. However, both the "D" or "E" and the new grade are used to compute the grade point averages. Grades on transfer work will not be used in computing grade point averages.

Research Assistant Requirements

The Department of Biomedical Informatics requires students who are receiving support as research assistants to be enrolled in nine credit hours during all semesters of their appointment as a research assistant. Neither audit enrollment nor enrollment in courses taken to meet a deficiency requirement count toward the requirement for enrollment in nine credit hours.

Note: The ASU Graduate Education and International Students and Scholars Office policy for maintaining a full course of study for RAs, does not meet the minimum departmental requirements.

Time Limit

Master's Students are expected to complete the Master's degree program within two years. Exceptions must be approved by the Faculty Advisor.

Doctoral students are expected to complete the PhD degree program within 4-5 years. In addition, the student must complete the following within the allotted time frame:

- The defense of the dissertation must take place at least 6 months after the student is advanced to candidacy.
- PhD students are expected to complete the PhD degree within three years of achieving candidacy.

Exceptions must be approved by the Faculty Advisor and the student's supervisory committee. All Students must be enrolled for at least one semester hour of credit within BMI during the semester or summer session in which they will graduate.

Advising

To ensure that academic programs run as smoothly as possible, students should consult with their Graduate Coordinator prior to registering for classes each semester. Coursework is ultimately reviewed and approved by the Faculty Advisor when the iPOS is submitted and approved.

Application for Graduation

Students should apply for graduation during the semester of planned graduation and no later than the date specified at the Graduate Education website http://graduate.asu.edu/graddeadlines.html. Students can apply for graduation online through MyASU or in-person through the ASU Graduation Office, located in the Student Services Building.

Master's Degree (MS)

Initial Faculty Advisor, Master's

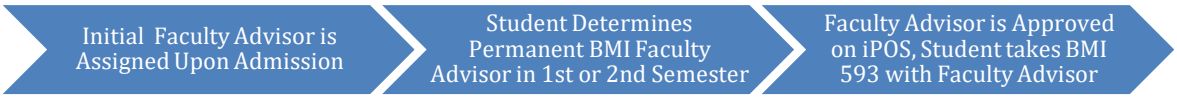
Upon admission to the BMI MS program, students are assigned an initial Faculty Advisor. The Initial Faculty Advisor will serve as their temporary advisor, until the student determines a Faculty Advisor they will ultimately work with on their Applied Project.

Students will meet with their faculty advisor at least two times per year, usually at mid-semester. The student must meet with the Initial Faculty Advisor for an advising session to do the following:

- Advise students on their overall academic program, evaluate academic progress, moderate concerns
- Ensure students have a broad education base covering all areas in biomedical informatics
- Initial requests to take electives (not on the pre-approved list) must be approved through the Faculty Advisor, as well as the Academic Program Committee Director.

Selection of Faculty Advisor

Students are required to identify a faculty member who is willing to act as his or her Faculty Advisor throughout the program, and serve as chair of their Applied Project. Once the official Faculty Advisor has been identified, students will update the Faculty Advisor as chair in the iPOS system. Process shown below:



Course and Graduation Requirements

A Sample Plan of Study is provided below. This is provided as an example only. Each student's program will be unique to the student's individual needs and interests.

Sample Plan of Study				
Year	**Term (Session)**	**Course**	**Credits**	**Title**
1st Year	**Fall (Required in 1st Term)**	**BMI 601**	**3**	**Health Informatics (BMI Core Course)**
1st Year	**Fall (Required in 1st Term)**	**BMI 502**	**3**	**Foundations BMI Methods I (BMI Core Course)**
1st Year	**Fall**	**BMI 504**	**3**	**Introduction to Clinical Environments (BMI Core Course)**
1st Year	Fall	BMI 570	1	BMI Symposium
1st Year	**Spring (Required in 2nd Term)**	**BMI 505**	**3**	**Foundations of BMI Methods II (BMI Core Course)**
1st Year	Spring	Elective	3	BMI Elective - Pre-Approved Courses Listed Below
1st Year	Spring	Elective	3	BMI Elective - Pre-Approved Courses Listed Below
1st Year	Spring	BMI 570	1	BMI Symposium
2nd Year	**Fall**	**BMI 540**	**3**	**Problem Solving in BMI (BMI Core Course)**
2nd Year	Fall	Elective	3	Elective - Pre-Approved Courses Listed Below
2nd Year	Fall	Elective	3	Elective - Pre-Approved Courses Listed Below
2nd Year	Spring	BMI 593	3	Applied Project (Scientific Paper or Applied Project)
			32	**Total Credits**

Required Core Courses
The core courses are designed to provide students from diverse backgrounds with a solid grounding in the research methods in BMI and in the applications of BMI in health and biology. Required core courses for the MS are as follows:

- BMI 601: Health Informatics (3 credits)
  (Required for all students in the first semester)
- BMI 502: Foundations of Biomedical Informatics Methods I (3 credits)
  (Required for all students in the first semester)
- BMI 504: Clinical Environments (3 credits)
- BMI 505: Foundations of Biomedical Informatics Methods II (3 credits)
  (Required for all students in the second semester)
- BMI 540: Problem Solving in Biomedical Informatics (3 credits)

Additional Requirements for Master's degree:

- BMI 570: Symposium (2 credits)
- BMI Electives (6 credits), choose from list of BMI electives
- Electives (6 credits), choose from pre-approved list, or propose an additional course
- BMI 593: Applied Project (3 credits)

Core BMI courses are offered on a once-a-year basis. Thus, failure to complete a required graduate course during the appropriate semester of enrollment may delay graduation.

Applied Project (3 credit hours)
To complete the Master's of Science in Biomedical Informatics, all students must complete a final culminating experience (BMI 593 Applied Project). BMI 593 must be completed after the first year of study.

The Faculty Advisor/chair will serve as instructor for the BMI 593 Applied Project course. An additional committee member also needs to be selected, and should have an understanding of the students applied project, but does not need to be indicated on the students graduate iPOS. Additional project committee members are allowed, but are not required.

A full proposal will be required by your instructor at the beginning of the semester and should include the following components: understanding the problem, an execution plan, and a project timeline. The problem has a certain history (in the specific setting and the world beyond), it relates to similar problems documented in the scholarly literature and progress towards a solution can be documented. The Applied Project should have a review of the literature, characterization of the problem and perhaps, the state of affairs (e.g., current technology infrastructure). An important part of the project is likely to be documenting the progress and the students own role in fashioning a solution. The student may choose to interview key personnel or conduct a mini survey. In addition, individual observations may be critical in the formulation of the project.

A couple of clear examples are projects that involve software development, app development, implementation, community outreach, public (or consumer) health

data analysis, needs requirements analysis, database modeling, translational bioinformatics projects, knowledge management and so forth. Additionally, the project should draw on informatics skills, knowledge or methods.

Final submission should include report at least 30 pages. Submission of the project report written as a journal publication is also encouraged, but not required. Students must receive a B or better in the BMI 593 course, to be eligible for graduation.

Steps to Achieve the BMI Master's Degree

In addition to the required coursework, the additional steps to achieve a MS in Biomedical Informatics are listed below. The program is designed to be completed in 2 years.

Year 1

Fall Semester
Meet with Initial Faculty Advisor Assigned
(Student Should Determine Permanent BMI Faculty Advisor in 1st or 2nd Semester)

⇓

Spring Semester
Identify BMI Faculty Advisor, Discuss Applied Project Interests
Submit Interactive Plan of Study (iPOS) And Have Faculty Advisor Approve the iPOS

⇓

Summer Semester
Internship (Optional)
Work With Faculty Advisor to Brainstorm Topic for the Applied Project

⇓

Year 2

Fall Semester
Check iPOS, Make sure it has Been Approved by the BMI Graduate Coordinator and There Are No Pending Changes Required (to Faculty Advisor or Coursework)
Finalize Topic for the Applied Project
Get Approval from Faculty Advisor to Register For
BMI 593 Applied Project and Submit *Form* to Graduate Coordinator
Update iPOS (if necessary)

⇓

Spring Semester
Apply For Graduation in MyASU before the Deadline
Update iPOS (if necessary)
Complete the Applied Project and Receive a "B" or Better

⇓

Graduation

Doctoral Degree (PhD)

Initial Faculty Advisor, PhD

Upon admission to the BMI PhD program, students are assigned an initial Faculty Advisor. The Initial Faculty Advisor will serve as their temporary advisor, until the student determines a Faculty Advisor they will ultimately work with for their research and dissertation work.

Students must meet with their Faculty Advisor at least two times per year, usually at mid-semester, in a formal advising session to do the following:

- Advise students on their overall academic program and evaluate academic progress
- Ensure students have a broad education base covering all areas in biomedical informatics
- Moderate student concerns
- Approve requests to take non-BMI electives outside of the list of non-BMI electives that have been approved as counting toward the course credit requirement for the PhD degree

Information prepared by the student using the BMI Student Advising forms (found on ORG-BMI Blackboard) is reviewed by the student and the Faculty Advisor during a formal advising session. The faculty member signs the forms. When all required signatures are obtained, the student gives the original to the Graduate Coordinator.

Selection of a Faculty Advisor and Formation of a Supervisory Committee

Students are required to identify a faculty member who is willing to act as his or her Faculty Advisor throughout the program and serve as the chair of their supervisory committee. Once a Faculty Advisor has been identified, students consult with the Faculty Advisor to form a supervisory committee.

A supervisory committee must have at least three members. Two members must be core BMI faculty members. The Faculty Advisor will act as chair of the student's supervisory committee. Only tenured or tenure-track faculty are granted status to approve the required scientific paper. Please check with the Graduate Coordinator about supervisory committee chair eligibility for BMI.

If the student performs research outside of the department, a BMI core faculty will be designated to oversee that student's research in collaboration with the Faculty Advisor off-site. In this situation, the BMI core faculty member will also serve as chair of the student's supervisory committee.

Qualified individuals outside the university, upon recommendation of BMI and approval of Graduate Education, may serve as members of the supervisory committee in addition to the two core faculty members from BMI. The request to have an individual outside the university serve on a supervisory committee should be made using the Committee Approval Request form found at: https://graduate.asu.edu/sites/default/files/StudentCommitteeApproval.pdf. The completed form must be accompanied by a copy of the nominees' current curriculum

vitae. Please check with the Graduate Coordinator about supervisory committee eligibility for BMI.

A faculty advisor should be selected during the students second semester, so that the Faculty Advisor can provide effective direction for the remainder of the student's program. The remaining supervisory committee members should be selected by early in the third semester AT THE LATEST.

Once a faculty advisor has been identified, students consult with the Faculty Advisor to form a supervisory committee. The student contacts potential members of the supervisory committee and obtains their agreement to serve as a member of the supervisory committee. The agreement of each member to serve on the Committee should be sent to the chair of the supervisory committee.

Once the supervisory committee is established, changes to the committee are discouraged. Any changes to the committee must be must be approved by all members of the student's supervisory committee chair.

Course and Graduation Requirements

The Plan of Study comprises a minimum of 84 semester hours of academic credit as described in the table. There is a requirement that the student have B or better grade in all BMI required core course. There are requirements to 1) pass a comprehensive examination; 2) prepare a research prospectus and defend it orally; and 3) do research, prepare a dissertation based on the research, and defend the dissertation orally.

Sample Plan of Study: PhD

A Sample Plan of Study is provided as an example only. Each student's program will be unique to the student's individual needs and interests.

Core BMI courses are offered on a once-a-year basis. Thus, failure to complete a required graduate course during the appropriate semester of enrollment may delay graduation.

Sample Plan of Study				
Year	**Term (Session)**	**Course**	**Credits**	**Title**
1st Year	**Fall (Required in 1st Term)**	**BMI 601**	**3**	**Health Informatics (BMI Core Course)**
1st Year	**Fall (Required in 1st Term)**	**BMI 502**	**3**	**Foundations BMI Methods I (BMI Core Course)**
1st Year	**Fall**	**BMI 504**	**3**	**Introduction to Clinical Environments (BMI Core Course)**
1st Year	Fall	BMI 570	1	BMI Symposium
1st Year	**Spring (Required in 2nd Term)**	**BMI 505**	**3**	**Foundations of BMI Methods II (BMI Core Course)**
1st Year	**Spring**	**BMI 515**	**3**	**Applied Biostatistics in Medicine and Informatics (BMI Core Course)**
1st Year	Spring	Elective	3	BMI Elective - Pre-Approved Courses Listed Below
1st Year	Spring	BMI 570	1	BMI Symposium
2nd Year	**Fall**	**BMI 540**	**3**	**Problem Solving in BMI (BMI Core Course)**
2nd Year	Fall	Elective	3	BMI Elective - Pre-Approved Courses Listed Below
2nd Year	Fall	Elective	3	BMI Elective - Pre-Approved Courses Listed Below
2nd Year	Spring	Elective	3	BMI Elective - Pre-Approved Courses Listed Below
2nd Year	Spring	Elective	3	BMI Elective - Pre-Approved Courses Listed Below
2nd Year	Spring	Elective	3	Elective - Pre-Approved Courses Listed Below
2nd Year				Comprehensive Exam
2nd Year	Summer	BMI 792	1	Research
3rd Year	Fall	BMI 560	1	Teaching Biomedical Informatics
3rd Year	Fall	Elective	3	Elective - Pre-Approved Courses Listed Below
3rd Year	Fall	Elective	3	Elective - Pre-Approved Courses Listed Below
3rd Year	Fall	BMI 792	3	Research
3rd Year	Spring	BMI 560	1	Teaching Biomedical Informatics
3rd Year	Spring	BMI 792	3	Research
3rd Year	Spring	Elective	6	Elective - Pre-Approved Courses Listed Below
3rd Year	Summer	BMI 792	1	Research
4th Year	Fall	BMI 792	6	Research
4th Year	Fall	Elective	3	Elective - Pre-Approved Courses Listed Below
4th Year	Fall	Elective	3	Elective - Pre-Approved Courses Listed Below
4th Year	Spring	BMI 799	12	Dissertation
			84	**Total Credits**

Required Core Courses

The core courses are designed to provide students from diverse backgrounds with a solid grounding in the research methods in BMI and in the applications of BMI in health and biology. Required core courses for the PhD are as follows:

- BMI 601: Health Informatics (3 credits)
  (Required for all students in the first semester)
- BMI 502: Foundations of Biomedical Informatics Methods I (3 credits)
  (Required for all students in the first semester)
- BMI 505: Foundations of Biomedical Informatics Methods II (3 credits)
  (Required for all students in the second semester)
- BMI 504: Clinical Environments (3 credits)
- BMI 515: Applied Biostatistics in Medicine and Informatics (3 credits)
- BMI 540: Problem Solving in Biomedical Informatics (3 credits)

Additional Requirements for PhD degree:

- BMI 570: Symposium (2 credits)

- BMI Electives (15 credits), choose from list of BMI electives
- Additional Electives (17-23 credits), choose from pre-approved list, or propose an additional course
- BMI 560: Teaching Biomedical Informatics (2 credits)
- BMI 792: Research (12-18 credits)
- BMI 799: Dissertation (12 credits)

•No more than 9 credit hours of reading and conference (independent study) courses (BMI 790) can be used to satisfy the credit hour requirement.

•A maximum of 18 credit hours of research (BMI 792) be used to satisfy the credit hour requirement. A minimum of 12 credit hours of research are required to satisfy the credit hour requirement. Only 6 credits of 792 can be taken prior to passing the comprehensive exam.

•No more than 12 credit hours of dissertation (BMI 799) can be used to satisfy the credit hour requirement.

Research

After advancing to candidacy, students register for BMI 792 (Research) to conduct the research described in their prospectus.

NOTE: The student may also register for up to 6 credits of academic credit (BMI 792) prior to taking the comprehensive examination (but are not required to register for BMI 792 to prepare the prospectus). To register for BMI 792 to prepare the prospectus, the student must prepare a one to two page (single-spaced) high-level description of the proposed work that will be done to prepare the prospectus. Each member of the student's supervisory committee must sign the BMI 792 Research Application form after reviewing this description.

Exceptions to this policy will be considered on a case by case basis, and must be reviewed by the Academic Programs Committee.

Required Teaching Assistant

BMI PhD students are required to gain skills in teaching by acting as a limited Teaching Assistant (TA) in two different BMI courses in two different semesters (BMI 560). Students serving in the role as limited TA are encouraged, but not required, to take the TA Development Program offered by Graduate Education.

Students may act as limited TAs for courses they have not taken at ASU if they have suitable training and skills. The course instructor determines whether a student is qualified to be a limited TA in a course not taken at ASU. Students CANNOT enroll simultaneously for course and limited TA credit in the same course.

Students earn one academic credit per limited TA course. Students do not receive funding support for being a limited TA. It is expected that the course duties for the limited TAship will take 2-3 hours per week.

Duties provided as a limited TA include the following:

- Blackboard

    - Assist instructor with initial set up and organization
    - Post items to Blackboard
    - Troubleshoot student access to Blackboard
- Assist Students
    - Communicate concerning assignments and other materials
    - Locate online tutorials and other assistance for students who need help
- Prepare Assignments
    - Locate and post files for course readings
    - Design homework exercise or other assignment
- Prepare and Present Lecture(s)
- Attend selected classes
- Support Instructor in Classroom Set-up (ie. AV equipment)

Masters in Passing

The Master's in Passing (MIP) option is available to exemplary students accepted into the PhD program without a prior master's degree. The Master's in Passing option is not automatically available to all PhD. students. Information on the specific requirements and the process is available from the Graduate Coordinator.

Comprehensive Examination

BMI doctoral students will take the comprehensive examination no later than the fourth semester of studies in their doctoral degree program. When students have completed their core and BMI approved elective courses, have chosen an area of research, and have an approved Plan of Study, they may take the comprehensive examination. The comprehensive examination is usually taken not later than the end of their second year. PhD comprehensive examinations are administered by the student's supervisory committee.

The comprehensive examination will be comprised of two components (written exam and oral exam). Students will take the written examination utilizing a one-day format with a morning session, along with an afternoon session. Written examination questions will focus on BMI core and BMI elective courses that students have taken as part of their BMI doctoral studies. The comprehensive exam will be a closed book examination for students. The comprehensive examination committee will review the written responses and will assign any of the following designations: pass as written, pass dependent on satisfactorily rewritten or revised questions, or fail. Students who pass the written examination component will be notified and scheduled to take the oral examination component within 5-10 business days after passing the written exam.

The oral examination component will consist of questions that focus primarily on written examination material and adjacent areas. However, the first 20 minutes or so of the exam will be devoted to the student's area of research. The student will begin by giving a 5 minute or so informal presentation (no slides necessary) about their research or their area of research. This will be followed by 15 minutes in which the examiners will ask the student related questions. We fully recognize that students may not yet know their specific topic of research and questions will be at a more general level. The next phase will focus on questions emanating from the student's responses to the written exam. Please note that general questions from other areas of discussion within BMI may be included, however, the focal point will be the student's written exam. After the comprehensive examination is taken, the student

must fill out Part I of the Report of Doctoral Comprehensive Examination form https://bmi.asu.edu/academics/current-students/forms and submit it to the examining committee chair for signatures from the examining committee. The student should then submit the form with committee signatures to the Academic Advisor Coordinator who will forward the completed form to Graduate Education.

Failure in the comprehensive examination is considered final unless the supervisory committee and the head of the academic unit recommend, and the Vice Provost for Graduate Education approve a re-examination. Only one re-examination is permitted. A petition for re-examination, endorsed by the members of the student's supervisory committee and the head of the academic unit, must be approved by Graduate Education dean before a student can take the second examination. Re-examination may be administered no sooner than three months and no later than one year from the date of the original examination. Graduate Education may withdraw a student from his/her degree program if the student's petition for re-examination is not approved, or if the student fails to successfully pass the retake of the comprehensive exam.

Dissertation Prospectus

BMI doctoral students must complete a dissertation proposal/prospectus, defend the prospectus orally and submit the results of the oral defense to Graduate Education.

The prospectus must contain:

1. a statement of the proposed research and why it is important.
2. an overview of bibliography of the relevant literature.
3. a description of the student's competence in conducting the research
4. a discussion of how the research will be approached (including specific criteria for the completion of the research broken down by research tasks, and the order in which the tasks will be completed).
5. a projected time-table and outline of the dissertation.

The length of the written dissertation prospectus should be 20-30 pages double-spaced.

The required oral examination in defense of the dissertation prospectus is administered by the supervisory committee no later than six months after a student passes the comprehensive examination. The defense will be public but the committee will also meet privately with the candidate.

The student must schedule a room for the oral presentation through BMI for a date and time agreed to by the supervisory committee. The presentation must be announced (this is done by BMI department secretary upon request from the student) and open to the department faculty. Attendance by others is left to the discretion of the supervisory committee. The announcement must include an abstract, the name of the student, the names of the supervisory committee members along with the time, date and place of the presentation of the dissertation prospectus.

The student must submit a copy of the dissertation prospectus to each member of the supervisory committee at a suggested 2 weeks before the presentation.

The committee evaluates the prospectus in terms of:

- The value of the research.
- The feasibility of the research plan.
- The student's preparation for carrying out the proposed research.

The committee accepts the dissertation prospectus, accepts it with changes, or rejects it (failure). If the committee accepts the dissertation prospectus with changes, the student must submit the revised dissertation prospectus to the supervisory committee no later than one month after the oral presentation of the prospectus. The committee must evaluate the revised prospectus no later than one month following the student's submission of the revision.

After the dissertation prospectus has been submitted, the oral defense completed, and all follow-up done, the student completes Part I of the Results of the Doctoral Dissertation Proposal/Prospectus Form and submits it to the examining committee chair for signatures of members of the supervisory committee on Part II of the form. https://bmi.asu.edu/sites/default/files/file_attachments/PhD%20proposal-prospectus%2010042011.pdf.

The completed form should be submitted by the student to the Graduate Coordinator who will forward the completed form to Graduate Education.

Failure of the doctoral dissertation prospectus defense is considered final unless the supervisory committee and the head of the academic unit recommend, and the Vice Provost for Graduate Education approve a second proposal defense. If a petition is approved, the student must submit the new prospectus by the end of six months (the six months start from the date that the first doctoral dissertation proposal defense was held). If the academic unit does not grant the student permission to retake the proposal defense, or if the student fails to pass the retake of the proposal defense, Graduate Education may withdraw the student from the degree program.

Admission to Candidacy

Ph.D students achieve candidacy status in a letter from the Vice Provost for Graduate Education after passing the comprehensive examination and successfully defending the dissertation prospectus. The Vice Provost for Graduate Education sends a letter admitting the student to candidacy after receiving the Results of the Doctoral Dissertation Proposal/Prospectus form reflecting approval of the prospectus. Candidacy status is updated through MyASU.

Dissertation

The written doctoral dissertation is based on an original and substantial scholarly research that constitutes a significant contribution to knowledge in BMI. The dissertation research must be conducted during the time of the student's doctoral studies at ASU, under guidance of ASU Graduate Faculty, and in accordance with graduate policies

PhD student's Plan of Study (iPOS) must include twelve credit hours, and no more than twelve credit hours, of BMI 799 Dissertation, which must be taken after the

successful defense of the dissertation prospectus and advancement to candidacy. Before enrolling for BMI 799, the supervisor committee chair and all members of the supervisory committee must sign the BMI 799 Dissertation Application.

After enrolling in BMI 799, must prepare a dissertation and successfully defend the dissertation in a final oral examination.

Graduate Education publishes information regarding the details of dissertation preparation, formal requirements, deadlines and oral examinations. The student must comply with all guidelines that Graduate Education publishes regarding the submission of a dissertation and the scheduling of a final oral examination. The following information should be reviewed:

- Thesis/Dissertation Format Preparation and Support
- Doctoral Defense Schedule Requirements
- Defense Announcement - posting of the defense is a state law. If the defense announcement is not posted 10 working days before the defense, then the defense MUST be re-scheduled to meet state law.

The student's supervisory committee will conduct the oral examination in defense of the dissertation.

Doctoral dissertation defenses are open to all members of the university community. Oral defenses are to be held on an ASU campus during regular business hours to facilitate student, faculty, and public accessibility. Students are encouraged to defend the dissertation during the fall or spring semester since many faculty members are not on campus over the summer and Graduate Education has strict rules about committee members being present at the defense.

Additional requirements are as follows. A student must be enrolled in at least one graduate-level course at the time of the defense. Students holding the defense during the interim period between semesters must be registered in the following semester. If defending during the period between the Spring and Summer semester, students must be registered for the Summer session. If defending during the period between the Summer session and Fall semester, students must be registered in the Fall semester. Please see Graduate Education policies.

At a date agreed upon by the supervisory committee but at a minimum of two weeks prior to the oral defense, the student must submit a final draft of the dissertation to all committee members for review. Failure to meet this deadline may result in the postponement of the defense date.

At least ten working days prior to the oral defense, the student must submit the materials for format evaluation and schedule the defense with Graduate Education. No exceptions to this rule will be made. Students should plan ahead since the forms submitted to Graduate Education require the original signature of the supervisory committee chair.

Please consult the Graduate Education's *Graduation Deadlines and Procedures* Web site https://graduate.asu.edu/progress/graduation_procedures and the 10 Working-

Day Calendar on this site. All dissertations must be formatted according to instructions provided by Graduate Education.
https://graduate.asu.edu/sites/default/files/How-to-Use-Online-Format-Tool.pdf

After the defense is scheduled with Graduate Education, the student should send the Graduate Coordinator the dissertation title page, abstract page, list of committee members, and the date, time, and location of the defense. The Graduate Coordinator will then post the announcement and send an e-mail notice to students and faculty prior to the defense.

Revisions to the dissertation are normal and must be completed in a timely manner. If the student is unable to complete revisions to the dissertation and meet the ASU deadline for the semester in which the defense is held, the student must complete the revisions, remain registered, and present the finished document to ASU within one year of the defense. Failure to do so will require the re-submission of the document for format review and may result in re-defense of the dissertation to ensure currency of the work.

After the oral defense of their dissertation, students must submit any required revisions and forms. They must also submit their dissertation to ASU through UMI/ProQuest.

Steps to Achieve the BMI PhD Degree

In addition to the required coursework, the additional steps to achieve a PhD in Biomedical Informatics are listed below. The PhD program is designed to be a 4-5 year program.

Year 1

Fall Semester
Meet with Initial Faculty Advisor
Investigate and apply for grant, fellowship, and funding opportunities outside of the School and ASU

⇓

Spring Semester
Meet with Initial Faculty Advisor
Identify Faculty Advisor/Chair and Supervisory Committee
Work on developing Research Interests & Plan of Study with Supervisory Committee
Submit *iPOS* to Graduate Coordinator (with approval signatures from committee)

⇓

Summer Semester
Internship (Optional)

⇓

Year 2

Fall Semester
Meet with Faculty Advisor & Supervisory Committee
Start Preparing for Comprehensive Examination, including bibliography
Investigate and apply for grant, fellowship, and funding opportunities outside of the School and ASU

⇓

Spring Semester
Meet with Faculty Advisor & Supervisory Committee
Schedule Comprehensive Examination
Pass the Comprehensive Examination, Submit *Report of Doctoral Comprehensive Examinations* to Graduate Coordinator
Update iPOS (if necessary) required for course changes, committee changes

⇓

Summer Semester
Defend Dissertation Prospectus (within 6 months of comprehensive Exam), Submit *Results of the Doctoral Dissertation Proposal/Prospectus Form*
Internship (Optional)

⇓

Year 3

Fall Semester
Meet with Faculty Advisor & Supervisory Committee
Work on Research
Investigate and apply for grant, fellowship, and funding opportunities outside of the School and ASU

⇓

Spring Semester
Meet with Faculty Advisor & Supervisory Committee
Work on Research
Update iPOS (if necessary) required for course changes, committee changes

⇓

Summer Semester
Internship (Optional)

⇓

Year 4

Fall Semester
Complete research and prepare for Dissertation work

⇓

Spring Semester
Work on Dissertation
Update iPOS (if necessary) required for course changes, committee changes
Apply for graduation
Schedule the Dissertation defense in MyASU (within 10 working day calendar)
Submit Dissertation to Committee and the Graduate College for Format Approval, *Survey of Earned Doctorates*
Pass Dissertation Defense, Submit *Dissertation Pass/Fail* form
Apply for commencement
Submit the approved dissertation to UMI/ProQuest

⇓

Graduation