



UTHealth  
Houston  
McWilliams  
School of Biomedical  
Informatics



## McWilliams School of Biomedical Informatics at UTHealth Houston

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# 2023-2024 CATALOG

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## Message from the Dean

### *Why Biomedical Informatics?*

#### ***We are in the throes of a fundamental economic and societal transformation.***

The Agricultural Revolution that took place around 10,000 BC liberated people from food insecurity via farming; the Industrial Revolution that commenced 200 years ago began to free people from grueling physical labor through machines; and the Artificial Intelligence (AI) Revolution occurring now is liberating people from cognitive labor through powerful computing, universal connectivity, and massive data. While AI has been disrupting and transforming many industries, including information access, communication, retail, manufacturing, agriculture, entertainment, travel, finance, and education, its seismic tremor is just beginning to impact the largest industry in the U.S., which accounts for nearly one-fifth of its GDP: Healthcare.

As a global academic leader in the areas of artificial intelligence, data science, and informatics for medicine and healthcare, McWilliams School of Biomedical Informatics at UTHealth Houston is helping the world reshape the future of medicine and healthcare through active engagement in the AI Revolution.

At McWilliams School of Biomedical Informatics, we collect, process, and convert data—ranging from molecules to populations—into actionable information, knowledge, and intelligence; we educate current and future leaders, innovators, and problem solvers across Texas, the nation, and the world; and we disrupt, transform, and innovate to elicit biomedical discoveries, improve healthcare delivery, and aid in disease prevention by conducting outstanding basic and applied research and developing impactful information technology products and solutions.

Our expertise comprehends three broad areas of education and research: (1) Data Science and Artificial Intelligence, (2) Clinical and Health Informatics, and (3) Bioinformatics and Systems Medicine. Moreover, the school's education programs are designed to cover the broadest student needs, including several Graduate Certificate programs (fully online), two MS programs (research and applied; both online and in-person), two doctoral degrees (PhD - emphasizing research and Doctorate of Health Informatics [DHI] - emphasizing application and executive training), and a growing number of dual-degree programs (e.g., MD/MS, PhD/MPH, and MS/MPH, etc.).

Our faculty and students represent a wide array of health professions (e.g., medicine, nursing, pharmacy, public health, etc.), as well as the fields of computer science and engineering, mathematics and statistics, clinical informatics and bioinformatics, biomedical engineering, the biomedical sciences, healthcare management, cognitive science, and the law. The diverse background of our faculty and students, coupled with the transdisciplinary nature of the school's education and research programs, creates a uniquely rich and rewarding collaborative environment that lays the groundwork for innovation and seminal discoveries.

The following list is representative of the research and applied projects undertaken by our faculty and students:

## The University of Texas Health Science Center at Houston

- Formulating new ways to integrate and harmonize biomedical data and transform them into actionable information, knowledge, and intelligence
- Building a Clinical Data Warehouse to optimize patient care and quality improvement and support clinical and translational research
- Employing deep learning to predict hospital readmissions, as well as heart failure, sepsis onset, Sudden Unexpected Death in Epilepsy (SUDEP), stroke onset and outcomes, and many other conditions and issues that are central to improving healthcare
- Using statistical methods to elucidate the genomic basis of cancer and other medical conditions
- Discovering new functions of existing FDA-approved drugs
- Monitoring and detecting adverse events related to drug interactions through the analysis of EHRs using machine learning and Natural Language Processing (NLP)
- Writing advanced cryptography algorithms to ensure the security of patient data
- Utilizing deep learning to detect computational biomarkers for Parkinson's disease and psychiatric disorders
- Deploying advanced data analytics methodologies to ensure healthcare quality and patient safety
- Developing and evaluating clinical decision support systems
- Applying deep learning to CT images of stroke patients to determine eligibility for endovascular thrombectomy
- Creating tools and guidelines to optimize EHR usability and workflow
- Inventing mobile platforms that deliver health information to patients
- Pioneering futuristic functions and modules for EHRs

McWilliams School of Biomedical Informatics is the only academic program of biomedical informatics in Texas, the only free-standing school among 70 such programs in the nation, and one of the largest programs of its kind internationally. If a diverse and challenging world-class learning environment is what you are seeking, then join us to be among the informatics leaders of today and tomorrow.

Computer scientist Alan Kay famously said, "The best way to predict the future is to invent it." In that spirit, I would invite you to lend your unique vision and abilities to our bold enterprise, as together we create an impactful future for healthcare delivery, disease prevention, and biomedical discovery.

At McWilliams School of Biomedical Informatics, we are ***Transforming Data to Power Human Health™***.

Jiajie Zhang, PhD

Dean and The Glassell Family Foundation Distinguished Chair in Informatics Excellence



## COVID-19 Update

The McWilliams School of Biomedical Informatics at UTHealth Houston continues to monitor the impact of COVID-19 and makes updates to school operations in the interest of our community's health and safety. Current and incoming students are required to complete all degree requirements as defined in the catalog for the year they matriculated into their degree program. Faculty, staff, and students can view updates to school operations on the School of Biomedical Informatics COVID-19 website (<https://sbmi.uth.edu/covid-19/index.htm>).

All decisions related to course delivery or academic requirements for the 2023-2024 academic year will be announced via email to the student's UTHealth Houston email address.

Additional information can be found on the UTHealth Houston COVID-19 Resources website.

## Academic Calendar 2023 - 2024

### FALL SEMESTER 2023

Classes Begin	August 28, 2023
Classes End	December 8, 2023
Final Examinations	December 11 - 15, 2023

### SPRING SEMESTER 2024

Classes Begin	January 8, 2024
Spring Break	March 18-22, 2024
Classes End	April 26, 2024
Final Examinations	April 29 - May 3, 2024

### SUMMER SESSION 2024 (12-WEEK SESSION)

Classes Begin	May 20, 2024
Classes End	August 9, 2024
Final Examinations	August 12 - 15, 2024

Note: At the discretion of the Dean, the attendance of certain individuals may be required on a scheduled university holiday and on other than the usual scheduled class dates because of practicum/preceptorship requirements. Holidays will be announced in the class schedule each semester/session.

## **Administration**

Jiajie Zhang, PhD  
Dean and Professor  
The Glassell Family Foundation Distinguished  
Chair in Informatics Excellence

Ryan Bien, MHA  
Associate Dean for Management

Susan H. Fenton, PhD, RHIA, FAHIMA  
Associate Professor and Associate Dean for  
Academic and Curricular Affairs

Amy Franklin, PhD  
Associate Professor and Associate Dean for  
Student, Faculty, and Community Affairs

Jaime Hargrave  
Executive Director, Student Affairs &  
Admissions

## **Faculty**

A list of current faculty members can be found at <https://sbmi.uth.edu/faculty-and-staff/index.htm>

**Mission of McWilliams School of Biomedical Informatics at UTHealth Houston**

**Vision**

McWilliams School of Biomedical Informatics at UTHealth Houston is *Transforming Data to Power Human Health™*.

**Mission**

The mission of the McWilliams School of Biomedical Informatics is to collect, process, and convert data—ranging from molecules to populations—into actionable information, knowledge, and intelligence; to educate current and future leaders, innovators, and problem solvers across Texas, the nation, and the world; to disrupt, transform, and innovate to elicit biomedical discoveries, improve healthcare delivery, and aid in disease prevention by conducting outstanding basic and applied research and developing impactful information technology products and solutions.

### **Application Information**

All applications to McWilliams School of Biomedical Informatics at UTHealth Houston are submitted and processed by the centralized application service, [Graduate Enrollment Management Centralized Application Services \(GradCAS\)](#).

Additional information is available by contacting the school's Office of Academic Affairs at:

The University of Texas Health Science Center at Houston (UTHealth Houston)  
McWilliams School of Biomedical Informatics  
Office of Academic Affairs  
7000 Fannin, Suite 600  
Houston, TX 77030  
Telephone: (713) 500-3591  
Email Address: [SBMIAdmissions@uth.tmc.edu](mailto:SBMIAdmissions@uth.tmc.edu)

Specific requirements for admission to the certificate and degree programs are provided in the program section of this catalog. The school is obligated to ensure academic quality and comparability for all applicants applying to our programs. As such, our school will only consider credits earned for degrees awarded from regionally-accredited institutions in our admissions process. For international applicants, coursework reviewed as part of the Course-by-Course Evaluation Report from WES or ECE must show the U.S. equivalency to coursework completed at a regionally-accredited institution.

#### **Non-Degree/Certificate Admission Process**

Completed applications are reviewed by the Certificate Program Coordinator(s). Recommendations for or against admission are made to the Associate Dean for Student, Faculty, and Community Affairs. The Certificate Program Coordinator(s) advise all certificate students.

#### **General Admission Process for Degree Programs**

The school's Admission, Progression and Graduation Committee reviews completed applications to the master's and doctoral programs.

The admission criteria include, but are not limited to:

- Prior academic preparation (depth, breadth, and performance): application, college transcripts, and letters of reference;
- Relevant work experience (particularly practice in the field of study): application, goal statement, curriculum vitae (CV) or resume, and letters of reference;
- Career goals: application, goal statement, and letters of reference;
- Motivation: goal statement, letters of reference, and college transcripts;
- Integrity: goal statement, and letters of reference;
- Standardized tests: GRE scores and TOEFL/IELTS (if required);
- Thesis, publications and other scholarly works: supplemental documents provided by applicant; and
- Success in overcoming social, economic or educational disadvantages.

Qualified applicants to the doctoral programs will be invited to interview with faculty members at the discretion of the committee. The Office of Academic Affairs will schedule personal interviews. In addition to the listed criteria, the applicant's communication skills and understanding of the program may be evaluated based on the personal interview. Admissions decisions will be made after interviews are completed.

### **Additional Application Requirements for International Applicants**

An international student is a student who is not a citizen or a permanent resident of the U.S. All international students must contact and must be cleared by the UTHealth Houston Office of International Affairs prior to registration. Here is additional information regarding the international applicant admission process. (Students with transcripts from an international institution may also be subject to one or more of the below criteria):

- The [Test of English as a Foreign Language \(TOEFL\)](#) or the [International English Testing System \(IELTS\)](#). For admissions consideration a minimum acceptable score of 94 on the internet-based TOEFL is required or a minimum acceptable overall score of 7.0 on the IELTS is required. Test scores are valid for two years from the test date. The official scores must be submitted directly to GradCAS from the applicable test center. Submit official TOEFL scores by using the reporting code B886; no department code is required. Submit official IELTS scores by sending them to GradCAS; no code is needed. Testing is at the applicant's expense.
- International applicants who have received a diploma from a university at which English is the language of instruction are not required to submit an English Language exam. If this school is outside of an English-speaking country, evidence that indicates the language of instruction will need to be provided with your application such as a letter from the University on official letterhead.
- International applicants must submit official transcripts and a course-by-course education evaluation of all transcripts from all universities attended outside the United States. The application forms for such an evaluation may be obtained online from the service providers, Educational Credential Evaluators, Inc., [www.ece.org](http://www.ece.org), and World Education Services, [www.wes.org](http://www.wes.org). Only evaluations from ECE or WES will be accepted. The results of the evaluation must be submitted directly to GradCAS by the agency. The evaluation report is at the applicant's expense.
- F-1 sponsorship is available for students in the Research Master's, and Ph.D. programs. F-1 sponsorship is not available for the Certificate, Applied Master's or DHI programs. International students are still eligible to apply for these programs and can be enrolled at a distance.
- The I-20 form, required by the Department of Homeland Security (DHS) and the United States Citizenship and Immigration Services (USCIS), is prepared by UTHealth Houston and issued to qualified non-immigrant applicants who have been admitted and who have demonstrated financial ability to support their education. Upon acceptance, the non-immigrant student will be asked to provide financial and visa information so that the I-20 form may be completed. The student must submit the completed form to the American Embassy in his/her country of origin in order to receive a student visa or must otherwise be eligible for F-1 status in the U.S. Please contact the UTHealth Houston Office of International Affairs for information (713-500-3176, [utoiahouston@uth.tmc.edu](mailto:utoiahouston@uth.tmc.edu)).

- Official transcripts of all previous academic institutions must be submitted to the Office of the Registrar.

### **Admissions Application Deadlines**

#### Certificates in Biomedical Informatics Application Deadlines

Fall admissions	July 1
Spring admissions	November 1
Summer admissions	March 1

#### Master of Science in Biomedical Informatics Application Deadlines

Fall admissions	July 1
Spring admissions	November 1
Summer admissions	March 1

#### Doctor of Philosophy in Biomedical Informatics Application Deadlines

Fall admissions	December 1
Spring admissions	July 1

#### Doctorate in Health Informatics Application Deadline

Fall admissions	March 1
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Address application inquiries to:

Office of Academic Affairs  
McWilliams School of Biomedical Informatics at UTHouston  
7000 Fannin, Suite 600  
Houston, TX 77030 713-500-3591  
[SBMIAdmissions@uth.tmc.edu](mailto:SBMIAdmissions@uth.tmc.edu)

Waiver or alteration of admission requirements, other than those mandated by statute, for admission to McWilliams School of Biomedical Informatics or of courses offered by the school, must be based upon a review of the circumstances, a justification and review by the faculty, and final written approval by the Dean. Requirements mandated by statute will not be waived or altered.

In order to register, a student must have on file in the Office of the Registrar official transcripts and documents of all previous academic work, and meet all admission requirements. A student who knowingly falsifies or is a party to the falsification of any official University record (including transcripts and/or application for admission) will be subject to the offer of admission being withdrawn, or disciplinary action, which may include dismissal from the University.

## Enrollment Status

Students who matriculate in the School of Biomedical Informatics fall into one of the following categories.

**Full-time Student:** a graduate student enrolled in at least nine semester credit hours (SCH) each during the fall and spring semester, or six semester credit hours in the 12-week summer session. Only those credit hours in UTHealth Houston courses taken for credit are counted in the calculation of credits designating a full-time student.

**Part-time Student:** a graduate student enrolled in a program for fewer than nine semester credit hours in the fall or spring semester, or fewer than six semester credit hours in the 12-week summer session.

**Certificate Student:** a student admitted to a certificate program seeking a certificate of completion of 15 semester credit hours. Enrollment in a certificate program does not entitle a student to admission to a degree-seeking program.

**Non-degree Student:** a student who is admitted to McWilliams School of Biomedical Informatics for one or more courses but not admitted to a degree or certificate program. Enrollment as a non-degree student does not entitle a student to admission to a program. A non-degree student is not eligible to receive a degree. Non-degree students will not be allowed to register for practicum/doctoral courses. Non-degree students can complete a maximum of 9 semester credit hours and must maintain a 3.0/4.0 grade point average.

**Accelerated Masters Student:** a student who is presently enrolled in a bachelors-level academic program at another accredited institution that has a signed Program Agreement with McWilliams School of Biomedical Informatics and has been admitted to McWilliams School of Biomedical Informatics to complete a graduate certificate at the same time as completing an undergraduate degree.

**Concurrent/Inter-institutional Student:** Concurrent and inter-institutional students can complete a maximum of 12 semester credit hours and must maintain a 3.0/4.0 grade point average.

Any degree or certificate seeking student enrolled at UTHealth Houston who is not admitted to a degree program or certificate program in McWilliams School of Biomedical Informatics can complete a maximum of 12 semester credit hours and must maintain a 3.0/4.0 grade point average.

## Student Enrollment

Students enroll each semester by using myUTH on the web at <https://my.uth.tmc.edu>. There is no on-site enrollment. Enrollment dates are announced in the online Registration Schedule found on the Office of Registrar website at: <http://www.uth.edu/registrar/current-students/registration/registration-schedule.htm>

## Financial Information

### Optional and Mandatory Fees

Certain mandatory and optional fees should be anticipated for enrollment at McWilliams School of Biomedical Informatics. Mandatory fees are required of all UTHouston students. Optional fees are not required, but the student may elect to subscribe to any of the services listed under optional fees. Tuition and fees are subject to change and become effective on the date enacted. The Texas Legislature does not set the specific amount for any particular student fee. Student fees are authorized by state statute; the specific fee amounts and the determination to increase fees are made by the university administration and The University of Texas System Board of Regents.

### Mandatory Fees

Any prospective student submitting an application through GradCAS for McWilliams School of Biomedical Informatics admissions consideration will be required to submit a non-refundable \$38 application fee as part of the GradCAS application process.

### Tuition

Beginning Fall 2023, Texas resident tuition is \$260 per semester credit hour. Non-resident tuition is \$868 per semester credit hour. All tuition and fees charged are authorized by statute and by regent approval and can be here: <https://www.uth.edu/student/bursar/tuition-2023-2024/student-services-fees-annual-2023-2024>.

A resident doctoral student who has a total of 100 or more semester credit hours of doctoral work at an institution of higher education is required to pay nonresident doctoral tuition rates. For more information contact the Office of the Registrar.

### Graduation Fee

A graduation fee of \$100, payable during the student's final academic term, is required of all degree-seeking students. This fee covers expenses associated with graduation but does not cover fees associated with renting or purchasing the ceremony regalia. This fee is charged whether or not the student participates in the formal commencement/graduation ceremony. Certificate students do not pay the graduation fee.

### Laboratory Fees

Laboratory fees are assessed in an amount to cover the costs of technology and resources used by the student. Laboratory fees are only assessed to a select number of McWilliams School of Biomedical Informatics courses. To see which courses are subject to laboratory fees, please review the course descriptions on page 77.



### **Course Fees**

Course fees offset the cost of additional requirements needed for the efficient operation of certain courses. These fees cover the cost of items like test materials for professional exam preparation or licensing fees for other resources provided within the course curriculum.

### **Professional Liability Insurance**

Every student enrolled in the School of Biomedical Informatics must have professional liability insurance coverage in force throughout each semester enrolled for the minimum policy amount of \$100,000 per claim. The professional liability insurance must include coverage for breach of confidentiality of protected health information in electronic or other patient records. Advance written notice or posting may change the minimum amount required by the Office of the Dean. The premium for this insurance is due at the time of initial registration and each fall and spring semester. The annual premium is prorated based on the student's date of entry. The annual premium is approximately \$14.50 per year.

### **Student Services Fee**

The Student Services Fee is a mandatory fee assessed per semester credit hour to all students. The fee provides funding towards student governance activities, Student Health & Counseling Services, Shuttle Service and recreational facilities. The annual fee of \$591.75 for academic year 2023-2024 is provided here at a per semester credit hour breakdown: <https://www.uth.edu/student/bursar/tuition-2023-2024/student-services-fees-annual-2023-2024>.

This fee is subject to increase as approved by the UT System Board of Regents.

### **Technology Fee**

The Technology Fee is collected for the purpose of funding technology costs within McWilliams School of Biomedical Informatics. The Technology Fee will be assessed to all students at \$225 every semester to cover the expenses associated with the software, hardware, programming, maintenance fees and technical support used by students. The fee will support the school's goal to be the best publicly supported biomedical informatics school in the US by conducting the highest quality programs in education, biomedical informatics applications and research. The fee will also enable McWilliams School of Biomedical Informatics to use the most current technology to train students and help attract the best and brightest students to our quality graduate programs.

### **Student Records Fee**

The Student Records Fee provides students with unlimited transcripts and enrollment verification documents. The charge is \$15.00 per academic year (\$5 per semester).

### **Optional Expenses**

- Transportation Expenses: Students are required to provide their own transportation to practicum sites.
- Academic Regalia Rental: The charge for rental of the cap and gown is approximately \$55 for master's students and \$80 for doctoral students. Information on ordering academic regalia is sent to students several months before annual commencement exercises. Additional information for graduates can be found here: <https://sbmi.uth.edu/current-students/graduation/>.

### **Competitive Academic Scholarship Awards**

Competitive Academic Scholarship awards are designed to facilitate the scholastic development of students who are in high academic standing.

The benefits of this award are two-fold: (1) a direct financial award, and (2) if the recipient is not a resident of Texas, the change in status to resident tuition for the semester the award was earned and the two subsequent semesters. The residency waiver is applied for the aforementioned semesters regardless of the student's enrollment in those semesters. All McWilliams School of Biomedical Informatics students are eligible to compete for these scholarships. The number of Competitive Academic Scholarships awarded each year is dependent on the availability of funds. Students are notified via email when scholarship applications are being accepted. Students must submit all applications and required application materials to be considered.

The criteria for selection are:

- Grade point average documented by the Director of Student Affairs
- Pattern of academic achievements, such as scientific papers, posters and/or presentations or any relevant honor, recognition or awards earned
- Relevant Biomedical Informatics community or volunteer experience including any Student Governance Organization (SGO) or Student InterCouncil (SIC) involvement
- Success in overcoming adversity

The McWilliams School of Biomedical Informatics Scholarship and Awards Committee considers all submissions. The Scholarship and Awards Committee is composed of McWilliams School of Biomedical Informatics faculty and a representative from McWilliams School of Biomedical Informatics Office of Academic Affairs. The recommendations of the Scholarship and Awards Committee are submitted through the Associate Dean for Student, Faculty, and Community Affairs for submission to the Dean. Notification of awards will be made by email.

**Summary of Estimated Annual Fees and Expenses Based on Full-time, On Campus enrollment**

**Yearly Program Expenses**

Immunization (approximate cost, one time only)	\$175
Student Criminal Background Check <sup>1</sup>	\$49
Tuition (based on 24 hours annually) <sup>2</sup>	
Resident	\$6,240
Non-Resident	\$20,832
Student Service Fee	\$591.75
Information Technology Access Fee	\$120
Technology Fee	\$675
Liability Insurance	\$14.50
Laboratory Fees	\$180 (varies by course selection)
Course Fees	\$50-\$200 (varies by course selection)
Graduation Fee	\$100
Transportation (Student’s responsibility) <sup>3</sup>	varies
Books, Supplies, Miscellaneous Program Expenses	*See “Estimated Program Expenses” below

**Personal Anticipated Monthly Expenses**

(Approximations) Apartment Rent <sup>4</sup>	
UT Housing (subject to availability) (Varies by number of bedrooms/sq ft)	\$1,050/per month
Daycare	varies
Health/Medical Insurance <sup>5</sup>	
Basic coverage for student only	\$3,313

<sup>1</sup> must have been completed in the last 12 months; employment criminal background checks from UTHealth Houston cannot be used for admission. There will be an additional fee for all international background checks. This fee varies by country. Additional fees may also be required for state and/or county searches.

<sup>2</sup> based on 9 semester hours fall and spring and 6 semester credit hours for summer; \$260 is resident cost per semester credit hour/\$868 is non-resident cost per semester credit hour.

<sup>3</sup> the student is responsible for personal transportation and parking fees to and from the university and clinical practicum sites

<sup>4</sup> does not include utilities or food costs

<sup>5</sup> Student Health Insurance - Current information available at UTHealth Houston Auxiliary Enterprises website at <https://www.uth.edu/auxiliary-enterprises/insurance/index.htm>. Though not required, health insurance is also available to purchase for students’ spouses and/or children. Contact Auxiliary Enterprises at [student-insurance@uth.tmc.edu](mailto:student-insurance@uth.tmc.edu) or 713-500-8400 to obtain an application for family coverage. Family coverage must match the coverage dates of the student. All students are required to show proof of coverage or proof of purchase of health insurance. International students also must provide proof of repatriation coverage or the student can purchase repatriation insurance for a cost of \$96/per year.

Note: All of the estimates above are subject to change without prior notification.

**Estimated Program Expenses for Biomedical Informatics programs per year:**

The expenses, which are specific to Biomedical Informatics, are estimated at:

<b>Item</b>	<b>Estimated Expenses</b>
Textbooks*, computer** (required), software	\$3,800
Lab Fees	\$30 per course (based on course selection)
Course Fees	\$50-\$100 (based on course selection)
\$550 per practicum hour***	not to exceed \$1,650

\* Textbooks – McWilliams School of Biomedical Informatics students are not under any obligation to purchase a textbook from a university-affiliated bookstore. The same textbook may also be available from an independent retailer, including an online retailer.

\*\* Computer (\$3,000 first year only) requirements are listed on the website (<https://sbmi.uth.edu/current-students/student-handbook/computer-requirements.htm>) and are subject to change.

\*\*\* Practicum/Preceptor site may require additional requirements, e.g., immunizations, insurance, drug testing.

In addition, students must pay required school expenses (tuition, fee, etc.). See the Summary of Estimated Annual Fees and Expenses Based on Full-time, On-Campus Enrollment which summarizes estimated expenses.

## **Academic Standards, Policies, and Procedures**

In order for students to maintain good standing and receive appropriate grades and credits for their work, they must adhere to the School's academic policies, procedures and standards.

The School requires a high level of academic achievement from our students, and the School has defined criteria for a student in good standing and a student in academic jeopardy. A letter grading system is used to assess the student's level of achievement.

### **Grading System**

"A" indicates excellent; "B" indicates good; "C" indicates unsatisfactory and may require students to repeat the course; and "F" indicates failing; "P" indicates passing; "W" indicates that the student has withdrawn; "I" indicates an incomplete grade, meaning that course requirements have not been satisfied. All letter grades are reported without modification of plus (+) or minus (-). Grades recorded for courses dropped after the withdrawal deadline will be recorded as "F." After a student accumulates their fourth (4) "W" grade, they will be subject to academic action, including dismissal from the program.

Grade point averages (GPA) are computed at the end of each semester using the following academic standard:

A = 4 points

B = 3 points

C = 2 points

I = not counted

P = not counted

W = not counted

F = 0 points

Graduate level courses in which a grade of "B" or better has been earned may not be repeated for credit. Any student receiving a grade of less than a "B" in a required course must retake the course and receive a grade of "B" or higher to continue on in their academic program.

### **Grade Reports**

Students may access their official term grade reports online through myUTH at <https://my.uth.tmc.edu>.

### **Grades of "C"**

A grade of "C" is not considered a satisfactory grade. Therefore, all grades of "C" require retake. For a course to count towards any degree plan, a "B" or better must be earned. All grades of "C" are applied to the academic transcript but will not count towards degree progression.

When students earn a grade of "C" in a Required Course, the student must retake the course. Students may only earn two grades of "C" in any two required courses. A third grade of "C" will result in dismissal.\*

When students earn a grade of "C" in an Elective Course, the student must retake the course. Students may take another appropriate elective to fulfill the elective requirement for which the "C" grade was earned.

\*Students are not permitted to earn more than two grades of “C”. A graduate student of this school will be dismissed if a third grade of “C” is earned in any course, including concurrent or inter-institutional courses.

### **Grades of “I”**

An incomplete or “I” grade may be given when course requirements have not been satisfied. A student must have completed at least 50% of the course curriculum requirements for a grade of “I” to be issued. A student must submit an Incomplete Grade Form to receive an incomplete or “I” grade. Students must remove a grade of “I” the academic semester following receipt of the “I” grade, or the incomplete grade will be converted to a grade of “F.” During the semester in which the “I” grade coursework is being completed, the student is not permitted to overenroll (e.g. enroll in more than a fulltime course load). Grades of “I” will not be used in calculating the grade point average. All “I” grades must be removed from a student’s record (course requirements satisfied) before the student is eligible for graduation. A student must be actively enrolled at UTHealth Houston in the semester they expect to graduate. Note that students are not permitted to request an “I” grade in consecutive semesters.

### **Grades of “F”**

Students are not permitted to earn a grade of “F”. A grade of “F” will result in automatic dismissal from the school.

### **Grades of “W”**

Students who elect a grade of Withdrawal (“W”) for a required course, must retake the course and earn a grade of “B” or higher to continue on in their academic program. When retaking a course after electing for a grade of “W”, a grade of “W,” “C,” or lower in the subsequent course is grounds for academic action, including dismissal from the program.

Only two grades of “W” will be allowed for a single elective course. After the second “W” grade is earned, the student is no longer eligible to register for that elective course.

The original grade of “W” will remain on the student transcript. Students are not permitted to earn more than four grades of “W” during their academic program. All enrollments in courses, including repeated courses, will be reflected on the student’s transcript.

### **Grades of “Pass/Fail”**

The courses that are graded on a pass/fail basis are described in the course description section of the catalog. In these instances, a symbol of “P” is used to designate “pass” and an “F” to designate “fail.” Hours for courses taken pass/fail that are passed are not entered in the grade point calculation; however, hours for courses taken pass/fail and failed are included in the grade point calculation. Students are not permitted to earn a grade of “F”. A grade of “F” will result in automatic dismissal from the school.

Each program establishes the maximum number of semester credits a student can take on a Pass/Fail basis during his or her study in that program. A maximum of three credit hours of Directed Study can be applied toward the Certificate program. A maximum of six credit hours of Directed Study can be applied toward the master’s and doctoral programs.

### **GPA Calculation**

Grade point average is calculated using grades and credit hours for courses except for those courses in which a grade of “I,” “W” or “P” is recorded. The grade achieved in a repeated course is included in the calculation. Those courses taken through concurrent enrollment are not used in calculating the grade point average. Courses obtained by Petition for Equivalency Credit (PEC), which are graduate courses transferred from other institutions, are not used in the calculation of the grade point average.

### **Student in Good Standing**

To be considered in “good standing” and making “satisfactory academic progress” at McWilliams School of Biomedical Informatics, a student admitted to a graduate degree program must be following the degree plan; must maintain a cumulative grade point average of 3.0 or above; and must not be on academic probation or suspension as determined by the Associate Dean for Academic and Curricular Affairs. To remain in good standing a graduate student may earn no grade less than a “B” during their program.

Each student will develop a degree plan with written approval of their academic advisor. The student must file a signed [degree plan](https://sbmi.uth.edu/current-students/curriculum/) (<https://sbmi.uth.edu/current-students/curriculum/>) each academic year that includes the required and/or elective courses as specified for their certificate or degree program.

### **Academic Probation**

Probation is an official warning status for a defined period of time that informs the student of unsatisfactory academic and/or professional performance, and provides the student an opportunity to improve. Any student who does not adhere to the academic and professional standards of McWilliams School of Biomedical Informatics is subject to probation or dismissal by the Associate Dean for Academic and Curricular Affairs.

Criteria upon which grades are based are given at the beginning of each course in the course syllabus. Professional standards include appropriate dress, attendance, conduct, and any particular standards required by the program. If a student has questions regarding academic and professional requirements or if assistance is needed in meeting the standards, the student should consult with the course instructor or advisor.

Following the completion of the semester in which any of the following occur, the Associate Dean for Academic and Curricular Affairs will place a graduate student on academic probation if the student (1) receives a grade of less than “B” (“C”) in a course while at McWilliams School of Biomedical Informatics or enrolled in a concurrent or inter-institutional course; (2) earns a calculated cumulative grade point average (GPA) of less than 3.0 or (3) fails to make satisfactory academic progress toward the degree. The graduate student is removed from academic probation at the end of the following registration period when no grade below “B” is assigned in a graduate course, a cumulative grade point average of 3.0 is achieved, and any other cause for probation is removed or remedied.

A McWilliams School of Biomedical Informatics graduate student will be dismissed if a third grade of “C” is earned in any course, including concurrent or inter-institutional courses.

Any student on academic probation is not eligible to receive McWilliams School of Biomedical Informatics scholarships and awards. Any student on academic probation is not eligible for student

employment at UTHealth Houston (including Pre-Doctoral Fellowship, Graduate Research Assistant, Graduate Assistant, and Teaching Assistant positions).

### **Student Conduct and Discipline**

All students are responsible for knowledge of and compliance with UTHealth Houston policies regarding student conduct. Students are referred to the UTHealth Houston Handbook of Operating Procedures (HOOP) Policy 186, Student Conduct and Discipline, located at <https://www.uth.edu/hoop/policy.htm?id=1448220>.

### **Course Attendance Policy**

Attendance is required for any student registered for an on-campus course. A student in an on-campus course missing more than three class meetings may be dropped at the discretion of the instructor.

International students studying on an F-1 visa are required to enroll and complete nine (9) credit hours in the Fall and Spring Semesters.. F-1 students may fulfill their full-time enrollment by enrolling in six (6) credit hours of face-to-face (on-campus attendance) coursework and one three (3) credit hour, online (distance learning) class. The online (distance learning) class is restricted to one class, not to exceed three hours. Any F-1 student who fails to enroll and complete full-time studies in Fall and Spring will be in violation of his/her visa status unless prior written approval is granted by the Office of International Affairs and reported to the U.S. Department of Homeland Security. The Office of International Affairs is required by U.S. Immigration regulations to report any F-1 student who fails to enroll and complete full-time enrollment (as described above) within the mandatory days of reporting. Any F-1 student who has questions regarding maintenance of F-1 status should make an appointment to meet with his/her International Advisor.

### **Academic Grade Grievance Procedure**

In attempting to resolve any student grievance regarding grades or evaluations, it is the obligation of the student first to make a serious effort to resolve the matter with the faculty member with whom the grievance originated. Individual faculty members retain primary responsibility for assigning grades and evaluations. The faculty member's judgment is final unless compelling evidence suggests differential treatment or mistake. If the evidence warrants appeal, the student must submit a request in writing within 30 days of the date of the evaluation in question and, in the case of a final grade for a course, within 30 days of the date the Registrar recorded the grade of the course in question. The request for the appeal with supporting evidence must be submitted to the Associate Dean for Student, Faculty, and Community Affairs, and the appeal must be resolved by no later than the end of the semester after the semester in which the grade was earned. Upon receipt of the request, the Associate Dean for Student, Faculty, and Community Affairs will review the case and submit a copy of the appeal to the appropriate Standing Committee of the Faculty Governance Organization for review and recommendation. The Standing Committee of the Faculty Governance Organization will review the request and render its recommendation in writing to the Associate Dean for Student, Faculty, and Community Affairs within 15 business days. The Associate Dean for Student, Faculty, and Community Affairs will submit a written recommendation to the Dean. The student will be notified in writing of the Dean's decision within seven business days of the Associate Dean for Student, Faculty, and Community Affairs' recommendation. The determination of the Dean is final.



### **Academic Dismissal and Appeal**

A student who is on academic probation for one semester and who does not achieve the minimum cumulative 3.0 GPA and the individual course grades necessary to be removed from probation, or remove the cause of probationary status, will be notified of dismissal from the program by the Associate Dean for Academic and Curricular Affairs and will not be allowed to continue in the program.

The student may request a reconsideration of the dismissal by submitting a written request to the Dean within five business days of receipt (electronic or hard copy) of the dismissal letter. The student must also send a copy to the Chair of the Admissions, Progression and Graduation Committee of the Faculty Governance Organization. The student must provide evidence in support of the request for reconsideration of the dismissal. The Admissions, Progression and Graduation Committee will review the request and render its recommendation in writing to the Dean within 15 business days. The student will be notified in writing of the Dean's decision within seven business days of the Committee's recommendation. The determination of the Dean is final.

### **Reapplication Following Dismissal**

Should a student reapply and be readmitted to the program from which he or she was dismissed, the student will be placed on academic probation for one semester. If the student fails to raise his or her cumulative GPA within that semester to 3.0, or if the student makes a course grade below that required to be removed from probation, or otherwise fails to meet standards to be off probation, the student will be dismissed from the School and may not be readmitted.

### **Five-Year Rule**

In order to keep its programs and coursework relevant and current, McWilliams School of Biomedical Informatics allows students to apply completed course credits to a certificate, master's, or doctoral program for no more than five (5) years after the course was successfully completed, with a grade of "B" or better.

These successfully completed courses may be applied at a later date toward the certificate/degree requirements for other academic programs at the school if the course is part of the program's current curriculum. If the grade earned and recorded on the student's transcript (by semester and year) exceeds the Five-Year rule, the course credits will expire and the course must be repeated to meet the program requirements, where applicable.

If the expired course no longer exists in the school Catalog of Courses during the semester a new or returning student enters the program, the student must take a new course to complete the program requirements.

Note that this Five-Year Rule is not applicable to credits earned during a period of continuous enrollment while studying at McWilliams School of Biomedical Informatics. Our students who maintain satisfactory program enrollment over a period of more than five (5) years, can apply all courses taken during their program tenure at the School, so long as the earned grade is a B or better and the student has not exceeded the stated time limit to complete the program in which they are enrolled.

### **Transfer Credit**

Transfer credit for equivalent graduate courses taken elsewhere may be awarded and used to meet degree requirements if their equivalency to a McWilliams School of Biomedical Informatics degree program course is approved through a Petition for Equivalency Credit (PEC). The maximum number of transferable semester credit hours is 3 for the certificate program, 12 for the master's program, 36 for the PhD program, and 21 for the Doctor of Health Informatics ("DHI") program. Contact the Office of Academic Affairs for information.

Courses that are being accepted at McWilliams School of Biomedical Informatics, including courses through a dual- or joint-degree program, can only be transferred in if the grade earned in the course is a "B" or higher. Courses for which grades of less than "B" were earned will not be accepted for transfer. Transfer credits are subject to the Five-Year Rule based on the semester and year the original credits were posted to a student's official transcript.

Applicants who are presenting course work from universities or colleges outside the United States to meet admission or graduation requirements are referred to the section on International Applicants in this catalog for additional requirements.

### **Petitioning for Course Equivalency**

A student who wishes to receive credit for a graduate course which he or she has taken at another institution and which is similar in content to any course offered at McWilliams School of Biomedical Informatics is to submit required documentation for a Petition for Equivalency Credit (PEC) to the McWilliams School of Biomedical Informatics Office of Academic Affairs during their first academic year.

Credit is only given to courses that match the current school Course Catalog. Courses for which grades of less than "B" were earned will not be accepted for equivalency. Courses must have been completed within the last five years to qualify. The submitted syllabus from the course taken must be from the semester and year the student completed the course. Syllabi from any other semester or year will not be accepted and the PEC will be denied. Course equivalency credits are subject to the Five-Year Rule based on the semester and year the original credits were posted to a student's official transcript.

Any exceptions to the policy must be approved by the Associate Dean for Academic and Curricular Affairs. For additional information, please contact the school Office of Academic Affairs.

### **Transfer between Academic Programs**

A student who is enrolled in a minimum of one (1) credit hour is eligible to transfer from one Academic Program to another. A change in Academic Program can only occur once during the course of academic study. The Academic Program must be at the same level or a lower level program.

A Change of Academic Plan Request Form must be submitted to the Office of Academic Affairs with a new goal statement outlining the student's goals in the new program. Students are not permitted to change their academic plan in their final semester of any degree program. Changes to academic plans cannot be made retroactively.

If approved, the student is expected to complete their Academic Program for the newly requested plan. At the time of program completion, re-application to McWilliams School of Biomedical Informatics is required for any subsequent program of study.

### **Reentry after Non-Attendance**

A student who has not enrolled in two consecutive registration periods (including the summer session) must submit a Reentry Form to the McWilliams School of Biomedical Informatics Office of Academic Affairs along with a new goal statement signed by the student's advisor indicating approval for reentry to the program. A student who has not enrolled for three or more consecutive registration periods will be dismissed and must reapply for admission to the program and the School.

### **Deferment for Newly Admitted Students**

A newly admitted student is allowed up to one year for deferment for certain programs. McWilliams School of Biomedical Informatics Office of Academic Affairs must be notified of all deferments in writing before the start of the semester. A student who defers admission will be governed under the catalog in effect during his or her first semester of enrollment at the school. Any newly admitted student who does not enroll for three consecutive registration periods shall no longer be considered an admitted student. This means the student must reapply for future admission to any program or degree offered at McWilliams School of Biomedical Informatics.

Deferment is not available in the Doctorate in Health Informatics (DHI) program. If a DHI student wants to defer admission, that student will need to reapply for a future semester.

### **Resignation from the University**

A student who withdraws from all courses enrolled at McWilliams School of Biomedical Informatics at the end of, or prior to, completing a scheduled semester, should notify his or her advisor and the Office of Academic Affairs in writing by submitting the UTHealth Houston Resignation Form, which can be found on the Registrar's website.

### **Clearance for Resignation, Graduation, or Dismissal**

Any student who submits for resignation or is dismissed from, or completes a program in McWilliams School of Biomedical Informatics must complete the official student clearance process. Such clearance is necessary to ensure that the student has met all obligations to specified offices in McWilliams School of Biomedical Informatics, UTHealth Houston, and the Texas Medical Center. A student clearance form and instructions for completing the clearance process may be obtained from the school's Office of Academic Affairs.

### **Leave of Absence**

The purpose of a leave of absence is to provide students time away from campus for personal reasons. The authority to grant a leave of absence and permission to return from a leave of absence resides with the Associate Dean for Student, Faculty, and Community Affairs. Each leave is individualized based on the needs of the student and handled on a case-by-case basis. A leave of absence may not exceed a period one year. If a student is absent for more than one year, the student must apply for readmission to the program. For additional information, please contact the school's Office of Academic Affairs.

### **Course Accommodation Requests**

Course accommodations are made in response to individual requests for accommodation. Information on disability issues can be found under HOOP 101 Disability Accommodation <https://www.uth.edu/hoop/policy.htm?id=1447954>.

If a student believes that he or she has a disability requiring an accommodation, they are to contact the Associate Dean for Academic and Curricular Affairs at (713) 500-3591. Faculty members who receive a request for an accommodation from a student must immediately notify the Associate Dean for Academic and Curricular Affairs. Faculty members may not unilaterally grant accommodations.

For additional information about the institutional Disability Accommodation policy, students can contact Diversity and Equal Opportunity at (713) 500-2255.

### **Registering /Adding a Course**

Prior to course registration, students are encouraged to work with their academic advisor or advising committee to determine the appropriate courses and course load for the upcoming semester. If a permission code is required for course registration, the student must request instructor approval via email and forward the instructor's approval to the Office of Academic Affairs at SBMIAcademics@uth.tmc.edu. Following this, the student must use myUTH at <https://my.uth.tmc.edu> to add the course to their schedule. Refer to the Office of the Registrar's, School of Biomedical Informatics Academic Calendar for deadline dates for adding a course for any semester or session. A student will be unable to add a course after the official reporting date.

### **Dropping or Withdrawing from a Course**

To drop a course during the add/drop period the student must go to myUTH at <https://my.uth.tmc.edu>. Courses which are dropped during the add/drop period are not reflected on the student's transcript. Please refer to the Refund Policy on the Registrar's Website here: <https://www.uth.edu/registrar/current-students/registration/refund-policy.htm> to determine what percentage, if any, students will receive as a refund for tuition paid prior to dropping the course.

To withdraw from a course after the 12<sup>th</sup> class day and before the last day to withdraw (listed on the Office of the Registrar's, School of Biomedical Informatics Academic Calendar for the semester) the student must submit a signed Add-Drop/Withdrawal Form to the Registrar's Office. Students must obtain signatures of the course instructor(s) and the Associate Dean for Academic and Curricular Affairs in order to drop the course(s). The student must return the completed form to the Office of the Registrar before the deadline for dropping a course. The grade recorded on the transcript will be a "W" - withdrawal. The "W" will not be calculated as part of the GPA.

If a student does not officially withdraw from the course, a grade of "F" will be assigned. A grade of "F" is recorded if a course is dropped after the deadline stated in the academic calendar for that semester or session.

A student, who withdraws from all courses enrolled at McWilliams School of Biomedical Informatics at the end of, or prior to, completing a scheduled semester, should notify his or her advisor and the Office of Academic Affairs in writing by submitting the UTHealth Houston Resignation Form, which can be found on the Registrar's website.

### **Auditing a Course**

. McWilliams School of Biomedical Informatics does not allow auditing of classes within the school. If a student is interested in auditing a course at another UTHealth Houston school please contact that school for more information. There is an audit fee of \$25 attached to an approved course for audit

### **Concurrent/Inter-Institutional Enrollment**

McWilliams School of Biomedical Informatics students may take courses for credit at area state colleges and universities through concurrent/inter-institutional enrollment. Courses taken by concurrent enrollment will not be calculated into the student's GPA. Students from other institutions concurrently enrolled at the school may complete a maximum of 12 semester credit hours at McWilliams School of Biomedical Informatics and must maintain a 3.0/4.0 grade point average in those courses. Information about participating institutions and procedures for concurrent enrollment can be found on the Registrar's website at: <http://www.uth.edu/registrar/current-students/student-information/concurrentinter-institutional-enrollment.htm>.

### **General Degree Requirements**

In order to receive a degree or a certificate from the McWilliams School of Biomedical Informatics, the student is required to fulfill certain academic, in residence, and degree candidacy requirements. An enrolled student must be in good academic standing and must have completed all the curricular requirements of that program before being eligible for a degree or certificate.

### **In Residence Requirement**

The term "in residence" refers to the minimum number of semester credit hours that must be earned at McWilliams School of Biomedical Informatics . A student must fulfill his or her in residence requirement in order to receive any academic degree or a certificate from this school. Refer to each degree section for specific semester credit hour minimum requirements.

### **Academic Honesty**

Academic honesty is the cornerstone of the academic integrity of a university. It is the foundation upon which the student builds personal integrity and establishes a standard of personal behavior. Because honesty and integrity are such important factors, failure to perform within the bounds of these ethical standards is sufficient grounds to receive a grade of "F" in any course and be recommended for disciplinary actions from McWilliams School of Biomedical Informatics.

The following are examples of academic dishonesty:

- Cheating
- Plagiarism
- Unauthorized collaboration
- Collusion
- Falsifying academic records
- Misrepresenting facts (e.g. providing false information to postpone an exam, obtain an extended deadline for an assignment, or even gain an unearned financial benefit)

- Any other acts or attempted acts that violate the basic standard of academic integrity (e.g. multiple submissions – submitting essentially the same written assignment for two courses without authorization to do so.)

Refer to the Student Conduct and Discipline section in the McWilliams School of Biomedical Informatics Student Handbook or to HOOP 186 Student Conduct and Discipline (<https://www.uth.edu/hoop/policy.htm?id=1448220>) and Appendix A - Unacceptable Student Conduct (<https://www.uth.edu/hoop/186-appendix-a.htm>) for more information.

### **Plagiarism/Self-Plagiarism**

For grade generating assignment submissions, students must always submit their own work.

Exception: If group work is allowed or required by the assignment or course.

Student should always provide citations to indicate inclusions from others' work in their papers and assignment submissions.

Students should not reuse in whole or in part their own previously submitted assignments, papers, text, data, etc. without explicitly indicating prior dissemination. This includes all graded/published artifacts of one's academic career including time at McWilliams School of Biomedical Informatics.

Students must have instructor permission if they plan to reuse a previous assignment submitted in another course for a grade.

Plagiarism may include:

- Words or ideas taken from someone else without acknowledgment
- Giving incorrect information about the source
- Changing the sequence or structure but using ideas without citation
- Not including material in quotes if directly taken from someone else's material and/or copying any amount of other's material.

Per the Exam Proctoring Policy found here: <https://sbmi.uth.edu/current-students/student-handbook/exam-proctoring.htm>, students' submitted work may be subject to evaluation from Turnitin for plagiarism prevention, and graded exams and quizzes will require the use of Proctorio, an online proctoring software.

Refer to the Student Conduct and Discipline section in the Student Handbook or to HOOP 186 Student Conduct and Discipline (<https://www.uth.edu/hoop/policy.htm?id=1448220>) and Appendix A - Unacceptable Student Conduct (<https://www.uth.edu/hoop/186-appendix-a.htm>) for more information.

### **Student Organizations/Student Governance Organization**

The Student Governance Organization (SGO) consists of all registered McWilliams School of Biomedical Informatics students in good academic standing. Any full-time student enrolled in a program at the school is eligible to become an elected representative of his or her program and will serve for one year.

The purpose of the Student Governance Organization is:

## The University of Texas Health Science Center at Houston

- to provide students of the school an organized feedback and advisory mechanism to the administration and faculty
- to provide students a mechanism by which they may have an impact on the decision-making processes
- to provide social, cultural and recreational activities for students of the school
- to provide representation to the UTHealth Houston Student InterCouncil

Additional information about the organization, its current officers and events can be found on the McWilliams School of Biomedical Informatics website here: <https://sbmi.uth.edu/current-students/sgo.htm>.

## **Educational Programs**

### **Biomedical Informatics**

Biomedical Informatics is the study of how health data is collected, stored, and communicated. The field also explores how the data is processed into health information suitable for scientific, administrative and clinical decision making and how computers and telecommunications technology can be applied to support these processes. Biomedical informaticians are in great demand and may work in various clinical, research and educational environments.

### **Essential Skills for Biomedical Informaticians**

Biomedical Informatics is a collaborative discipline that builds on several other fields such as information sciences, biomedicine, computer science, and mathematics. However, the field is also interdisciplinary and collaborative. For students who may need help gaining competencies in these foundation areas, courses are available to help. Solid background knowledge in these support areas is consistent with student success in the study of Biomedical Informatics.

To successfully perform the duties of a health informatician, an individual must be able to think critically and analytically, must demonstrate motivation, and must have a technical understanding of the computing environment that is the basis for informatics work. Students must be able to address problems in a clear and innovative manner. Other requirements include the ability to communicate in English both verbally and in writing at the graduate level and to work in interdisciplinary teams. Depending on their application area, students must have demonstrable proficiency with certain programming languages, college algebra, computer literacy skills, anatomy, physiology, health language, clinical care, and operational characteristics of healthcare.

### **Program Philosophy**

The ultimate goal of the program is to use informatics to improve the health of the people of Texas. McWilliams School of Biomedical Informatics strongly believes that healthcare will increasingly require a cooperative interaction among the health disciplines. The result will be practitioners who understand the technology, data, information, knowledge, assumptions and decision making of others as they attempt to design, provide and evaluate healthcare in the 21st century.

To that end, the Biomedical Informatics program stresses the development of interdisciplinary teams to evaluate and address the complex informatics issues that will face healthcare in the next century. Students will enter the Biomedical Informatics program with a strong base from their previous undergraduate or graduate studies, and will study how to communicate knowledge across traditional, professional, and organizational barriers. As they progress, students will acquire the principles and knowledge needed to organize, store, display, communicate, and evaluate that knowledge across a variety of systems – electronic, social, and political.

The Biomedical Informatics program will start from a strong scientific base and move to the application of informatics in a variety of areas related to the interests of students and faculty. These areas of interest may include, but are not limited to computational knowledge, electronic health records, health data science, health information visualization or bioinformatics.



Biomedical Informatics is always undergoing rapid change. New technologies, conceptual understandings, and computational processes ensure that the future will bring increasing rates of change and development. Students will have the knowledge and skills to address present issues and the adaptability to address future ones. The Biomedical Informatics program continuously aims to meet the needs of students, develop new research to advance the frontiers of the science, and be an active participant in the development and application of informatics initiatives in the community.

### **Program Description**

The Program in Biomedical Informatics is designed to be transdisciplinary in its focus. The program is the first in the nation that does not reside in a discipline-specific professional school. Students come from a variety of disciplines, and work in interdisciplinary teams to better understand the knowledge unique to each discipline and how that knowledge must be translated for use by other disciplines.

The certificate, masters and doctoral degree programs incorporate an interdisciplinary and integrative design that is unique to the field of biomedical informatics. Many existing informatics master and doctoral programs are organized around a specific discipline in which applications of informatics within that discipline are emphasized, e.g., medical informatics, nursing informatics, and dental informatics. The Biomedical Informatics program, on the other hand, is designed to be inherently transdisciplinary and integrative. This means that the fundamental informatics concepts that transcend and apply to all traditional healthcare disciplines are emphasized. Moreover, these programs will identify and teach the major informatics concepts that integrate and link diverse health disciplines, creating focus on patient healthcare.

## **Non-Degree Biomedical Informatics**

### **Program Description and Goals**

A student who is admitted to McWilliams School of Biomedical Informatics for one or more courses but not admitted to a degree or certificate program is considered a non-degree student. Enrollment as a non-degree student does not entitle a student to admission to a degree program within the school. A non-degree student is not eligible to receive a certificate or degree. Non-degree students will not be allowed to register for practicum/doctoral courses. Non-degree students can complete a maximum of 9 semester credit hours and must maintain a 3.0/4.0 grade point average.

Please note: F-1 sponsorship is not available for non-degree seeking programs.

### **Admission to the Biomedical Informatics Non-Degree Program**

The admission process to the certificate programs is designed to get the professional working applicant into a McWilliams School of Biomedical Informatics degree program by meeting minimal requirements.

The applicant should present a completed application and official documentation of the following:

1. Official transcripts from all colleges/universities attended with the minimum of a baccalaureate or higher degree awarded.
2. Goal Statement
3. A resume or curriculum vitae (as appropriate)
4. One Letter of Reference from an educator or employer
5. Students with international college transcripts must submit a course-by-course evaluation report by either World Education Services or Educational Credential Evaluators.

### **Application deadlines:**

Fall admission	July 1
Spring admission	November 1
Summer admission	March 1

The coursework completed as a Non-Degree Seeking Student is at the graduate level. A transcript showing graduate credits may be obtained from the Registrar's Office.

This coursework may be transferred into a degree program at McWilliams School of Biomedical Informatics. No grade lower than a "B" will be accepted to transfer into the certificate, master's or doctoral programs.

## Graduate Certificates

### Program Description and Goals

McWilliams School of Biomedical Informatics offers various Graduate Certificates designed for self-motivated professionals working in the health care and information technology fields. A certificate requires the student to complete a minimum of 15 semester credit hours.

The certificates provide professionals with an increased understanding of the opportunities and challenges involved in technology integration into health care. They will be able to participate in designing, planning, implementing and evaluating new software and hardware solutions at their institutions.

The school is experienced in providing education to working professionals. The certificate programs are designed to provide quality education to professionals on their schedule as courses can be completed online.

Upon satisfactory completion of the 15-semester credit hours, students will be awarded a certificate of completion from McWilliams School of Biomedical Informatics at UTHealth Houston.

Please note: F-1 sponsorship is not available for non-degree seeking programs, including certificate programs.

### Admission to the Biomedical Informatics Certificate Programs

The admission process to the certificate programs is designed to get the professional working applicant into the program by meeting minimal requirements.

The applicant should present a completed application and official documentation of the following:

1. Official transcripts from all colleges/universities attended with the minimum of a baccalaureate or higher degree awarded.
2. Goal Statement
3. A resume or curriculum vitae (as appropriate)
4. One Letter of Reference from an educator or employer
5. Students with international college transcripts must submit a course-by-course evaluation report by either World Education Services or Educational Credential Evaluators.

### Application deadlines:

Fall admission	July 1
Spring admission	November 1
Summer admission	March 1

The coursework completed as a Certificate Student is at the graduate level. A transcript showing graduate credits may be obtained from the Registrar's Office.

The semester credit hours earned in the certificate programs may be transferable into the corresponding degree-seeking program. No grade lower than a "B" will be accepted to transfer into master's or doctoral programs.

### **Academic Requirements for Biomedical Informatics Certificate Programs**

A student in any McWilliams School of Biomedical Informatics Certificate Program has up to five years (15 semesters) from the time of entry to complete the required course work. A student who has not enrolled in two consecutive registration periods (including the summer session) will have an academic hold placed on their myUTH account by the McWilliams School of Biomedical Informatics Office of Academic Affairs. Students with an academic hold will need to meet to discuss academic degree plan with their academic advisor to have the hold removed and be allowed to enroll in future courses. Unless the student is granted an approved Leave of Absence, a student who has not enrolled for three or more consecutive registration periods will be dismissed and must reapply for admission to the program and the School.

Courses marked with a \* have a \$100 Course Fee. Courses marked with a \*\* have a \$50 Course Fee.

#### **Curriculum for Biomedical Informatics Certificate Program**

The Biomedical Informatics Certificate Program offers the following curriculum with completion of 15 semester credit hours.

The Biomedical Informatics Certificate Program offers two different options. Option 1 is a set of five predetermined courses with an emphasis in Clinical Informatics.

BMI 5300 Introduction to Biomedical Informatics (3 credit hours)

BMI 5310 Foundations of Biomedical Information Sciences I (3 credit hours)

BMI 5313 Foundations of Electronic Health Records and Clinical Information Systems (3 credit hours)\*

BMI 5360 Clinical Decision Support Systems (3 credit hours)

BMI 6340 Health Information Visualization & Visual Analytics (3 credit hours)

BMI 5300 Introduction to Biomedical Informatics must be taken in the first semester. The other four courses can be taken in any order.

Option 2 is BMI 5300, Introduction to Biomedical Informatics and the student's choice (with advice from a certificate program advisor) of four courses selected from the course concentration listing. This option allows professionals to customize their studies to meet their background and needs.

A maximum of three credit hours of Directed Study can be applied toward the Biomedical Informatics Certificate program.

#### **Curriculum for Applied Biomedical Informatics Certificate Program**

The Applied Biomedical Informatics Certificate Program offers the following curriculum with completion of 15 semester credit hours.

The Applied Biomedical Informatics Certificate Program offers two different options. Option 1 is a set of five predetermined courses with an emphasis in Electronic Health Records (EHRs).

BMI 5300 Introduction to Biomedical Informatics (3 credit hours)

BMI 5301 The U.S. Healthcare System (3 credit hours)

BMI 5305 Legal and Ethical Aspects of Health Informatics (3 credit hours)

BMI 5313 Foundations of Electronic Health Records and Clinical Information Systems (3 credit hours)\*  
BMI 5328 Systems Analysis and Project Management (3 credit hours)\*\*

BMI 5300 Introduction to Biomedical Informatics must be taken in the first semester. The other four courses can be taken in any order.

Option 2 is BMI 5300, Introduction to Biomedical Informatics and the student's choice (with advice from a certificate program advisor) of four courses selected from the Applied Masters course offerings. This option allows professionals to customize their studies to meet their background and needs.

A maximum of three credit hours of Directed Study can be applied toward the Applied Biomedical Informatics Certificate program.

### **Curriculum for Joint Certificate in Public Health Informatics Program**

The Public Health Informatics Certificate Program is offered in conjunction with The University of Texas School of Public Health and offers the following curriculum with completion of 16 semester credit hours:

BMI 5300 Introduction to Biomedical Informatics (3 credit hours)  
BMI 5380 Principles and Foundation of Public Health Informatics (3 credit hours)  
PHM 2612 Epidemiology I (3 credit hours)  
PHM 1690 Introduction to Biostatistics in Public Health (4 credit hours)

The fifth course is the student's choice of one of the following courses (minimum of 3 credit hours):

BMI 5313 Foundations of Electronic Health Records and Clinical Information Systems (3 credit hours)\*  
BMI 5381 Methods in Public Health Informatics (3 credit hours)  
BMI 5382 Synthesis Project of Public Health Informatics (3 credit hours)  
PHM 1110 Health Promotion and Behavioral Sciences in Public Health (3 credit hours)  
PHM 2110 Public Health Ecology & the Human Environment (3 credit hours)  
PHM 3715 Management and Policy Concepts in Public Health (3 credit hours)

PHM 1690 Introduction to Biostatistics in Public Health, PHM 2612 Epidemiology I or BMI 5300 Introduction to Biomedical Informatics must be taken in the first semester.

Courses that are accepted at McWilliams School of Biomedical Informatics through the joint certificate program can only be transferred in if the grade earned in the course is a "B" or higher. Courses for which grades of less than "B" were earned will not be accepted for transfer.

Each student will develop a degree plan with written approval of their academic advisor. A signed [degree plan](https://sbmi.uth.edu/current-students/curriculum/) (<https://sbmi.uth.edu/current-students/curriculum/>) will be filed each academic year that includes the required and/or elective courses as specified for their certificate program.

### **Curriculum for Health Data Science Certificate Program**

## The University of Texas Health Science Center at Houston

The Health Data Science Certificate Program offers the following curriculum with completion of 15 semester credit hours. BMI 5300 Introduction to Biomedical Informatics must be taken in the first semester. The other four courses can be taken in any order based on individual course requirements.

BMI 5300 Introduction to Biomedical Informatics (3 credit hours)  
BMI 5007 Methods in Health Data Science (3 credit hours)  
BMI 6340 Health Information Visualization & Visual Analytics (3 credit hours)

The remaining 6 hours will be the student's choice of two of the following courses (minimum of 6 credit hours):

BMI 5304 Advanced Database Concepts in Biomedical Informatics (3 credit hours)  
BMI 5353 Biomedical Informatics Data Analysis (3 credit hours)  
BMI 5351 Research Design and Evaluation in Biomedical Informatics (3 credit hours)  
BMI 6306 Information and Knowledge Representation in Biomedical Informatics (3 credit hours)  
BMI 6318 Big Data in Biomedical Informatics (3 credit hours)  
BMI 6323 Machine Learning in Biomedical Informatics (3 credit hours)  
BMI 6331 Medical Imaging and Signal Pattern Recognition (3 credit hours)  
BMI 6334 Deep Learning in Biomedical Informatics (3 credit hours)

### **Curriculum for Pharmacy Informatics Certificate Program**

The Pharmacy Informatics Certificate Program offers the following curriculum with completion of 15 semester credit hours.

BMI 5300 Introduction to Biomedical Informatics (3 credit hours)  
BMI 5390 Methods in Pharmacy Informatics (3 credit hours)  
BMI 5391 Synthesis Project in Pharmacy Informatics (3 credit hours)

The remaining 6 hours will be the student's choice of two of the following courses (minimum of 6 credit hours):

BMI 5328 Systems Analysis and Project Management (3 credit hours)\*\*  
BMI 6316 Change Management in Health Informatics (3 credit hours)  
BMI 6340 Health Information Visualization and Visual Analytics (3 credit hours)

BMI 5300 Introduction to Biomedical Informatics must be taken in the first semester. The other four courses can be taken in any order based on individual course requirements.

### **For Certificate Program Information, contact:**

School of Biomedical Informatics  
Office of Academic Affairs  
7000 Fannin Street Suite 600  
Houston, TX 77030  
(713) 500-3591  
SBMIAcademics@uth.tmc.edu

### **Undergraduate Accelerated Master's (4+1) Program Certificate of Biomedical Informatics**

## Program Description and Goals

Undergraduate students have the opportunity to earn both a Bachelor of Arts/Science and a Master of Science in Biomedical Informatics over the course of five years through the Accelerated Master's Program. The program is an integrated program that overlaps graduate curriculum into the student's undergraduate work, which provides the opportunity to graduate with the bachelors at the same time as their Graduate Certificate in Biomedical Informatics. The student's undergraduate degree program must be in an appropriate area, e.g., biomedical science, pre-med, nursing, health sciences, life sciences, management information systems, or computer science to qualify for admission to the Accelerated 4+1 Program.

McWilliams School of Biomedical Informatics has collaboration agreements with the following institutions whose students are eligible to participate in this integrated curriculum:

- Texas A&M International University (TAMIU)
- University of Texas Rio Grande Valley (UTRGV)

The student will graduate with an undergraduate degree in their selected major course of study, but will also have the opportunity to complete a master's degree in Biomedical Informatics in one additional year instead of the customary two years.

Upon completion of the 15-semester credit hour certificate, students will be awarded a certificate of completion from McWilliams School of Biomedical Informatics at UTHealth Houston. A transcript showing graduate credits may be obtained from the Registrar's Office.

## Admission to the Accelerated Masters 4 + 1 Program

The admission process for the Accelerated Masters 4 + 1 program requires the submission of both a Pre-Application (<https://sbmi.uth.edu/prospective-students/academics/4-plus-1-uam.htm>) and a McWilliams School of Biomedical Informatics application. Both applications must include all supplemental documents.

### Step 1:

Prospective students are to complete the 4 + 1 Pre-Application where the applicant will upload the following items:

1. Copy of TAMIU or UTRGV Degree Audit or unofficial transcript
2. One Letter of Reference
3. Essay Question
4. See the Accelerated Masters 4 + 1 Program Admission Requirements webpages for additional information:

<https://sbmi.uth.edu/prospective-students/academics/4-plus-1-tamiu.htm>

<https://sbmi.uth.edu/prospective-students/academics/4-plus-1-utrgv.htm>

All documents for the Pre-Application must be submitted by October 15<sup>th</sup> for the Spring admission deadline, February 15<sup>th</sup> for the Summer admission deadline, and June 15<sup>th</sup> for the Fall admission deadline.

Candidates who successfully make it through the pre-application process will be cleared to begin step 2.

**Step 2:**

Upon meeting the requirements in Step 1, candidates are to submit the McWilliams School of Biomedical Informatics Application.

The applicant should present a completed application and official documentation through GradCAS of the following:

1. \$38 application fee
2. Goal statement
3. One Letter of Reference
4. An official transcript with minimum of a 3.0 GPA or higher in an appropriate area. Any dual credit or AP credits must be verified on the transcript from the present college or an official transcript from the awarding college or program.

**Application deadlines:**

Fall admission	July 1
Spring admission	November 1
Summer admission	March 1

Any student receiving a grade of less than a “B” in a required or elective course must retake the course and receive a grade of “B” or higher to continue on in their academic program. The original grade of “C” will remain on the student transcript. Students are not permitted to earn more than two grades of “C”. The third grade of “C” will result in dismissal from McWilliams School of Biomedical Informatics.

No grade lower than a “B” will be accepted for transfer into the McWilliams School of Biomedical Informatics master’s or doctoral program.

**Curriculum for Certificate Programs**

The course requirements for earning both the undergraduate degree and graduate certificate from the school will vary by participating institution. Please contact the McWilliams School of Biomedical Informatics Accelerated 4+1 Program Coordinator for additional information. Courses marked with a \* have a \$100 Course Fee. Courses marked with a \*\* have a \$50 Course Fee.

**TAMU Certificate offerings:**

**Applied Biomedical Informatics**

- BMI 5300 Introduction to Biomedical Informatics (3 credit hours)
- BMI 5306 Security for Health Information System (3 credit hours)
- BMI 5313 Foundations of Electronic Health Records and Clinical Information Systems (3 credit hours)\*



BMI 5301 The U.S. Healthcare System (3 credit hours)  
BMI 5328 Systems Analysis and Project Management (3 credit hours)\*\*

**Biomedical Informatics**

BMI 5300 Introduction to Biomedical Informatics (3 credit hours)  
BMI 5313 Foundations of Electronic Health Records and Clinical Information Systems (3 credit hours)\*  
BMI 5310 Foundations of Biomedical Information Sciences I (3 credit hours)  
BMI 5360 Clinical Decision Support Systems (3 credit hours)  
BMI 6340 Health Information Visualization and Visual Analytics (3 credit hours)

**Public Health Informatics**

BMI 5300 Introduction to Biomedical Informatics (3 credit hours)  
BMI 5380 Principles of Public Health Informatics (3 credit hours)  
PHM 2612 Epidemiology I (3 credit hours)  
PHM 1690 Introduction to Biostatistics in Public Health (4 credit hours)

The fifth course is the student's choice of one of the following courses (minimum of 3 credit hours):

BMI 5313 Foundations of Electronic Health Records and Clinical Information Systems (3 credit hours)\*  
BMI 5381 Methods in Public Health Informatics (3 credit hours)  
BMI 5382 Synthesis Project of Public Health Informatics (3 credit hours)  
PHM 1110 Health Promotion and Behavioral Sciences in Public Health (3 credit hours)  
PHM 2110 Public Health Ecology & the Human Environment (3 credit hours)  
PHM 3715 Management and Policy Concepts in Public Health (3 credit hours)

**UTRGV Certificate offerings:**

**Applied Biomedical Informatics**

BMI 5300 Introduction to Biomedical Informatics (3 credit hours)  
BMI 5306 Security for Health Information System (3 credit hours)  
BMI 5313 Foundations of Electronic Health Records and Clinical Information Systems (3 credit hours)\*  
BMI 5301 The U.S. Healthcare System (3 credit hours)  
BMI 5328 Systems Analysis and Project Management (3 credit hours)\*\*

**Biomedical Informatics**

BMI 5300 Introduction to Biomedical Informatics (3 credit hours)  
BMI 5330 Introduction to Bioinformatics (3 credit hours)  
BMI 5333 Systems Medicine: Principles and Practice (3 credit hours)  
BMI 5353 Statistical Methods of Genomic Data (3 credit hours)  
BMI 5327 Standards in Health Informatics (3 credit hours)

**Public Health Informatics**

BMI 5300 Introduction to Biomedical Informatics (3 credit hours)  
BMI 5380 Principles of Public Health Informatics (3 credit hours)  
PHM 2612 Epidemiology I (3 credit hours)

The University of Texas Health Science Center at Houston

PHM 1690 Introduction to Biostatistics in Public Health (4 credit hours)

The fifth course is the student's choice of one of the following courses (Minimum of 3 credit hours):

BMI 5313 Foundations of Electronic Health Records and Clinical Information Systems (3 credit hours)\*

BMI 5381 Methods in Public Health Informatics (3 credit hours)

BMI 5382 Synthesis Project of Public Health Informatics (3 credit hours)

PHM 1110 Health Promotion and Behavioral Sciences in Public Health (3 credit hours)

PHM 2110 Public Health Ecology & the Human Environment (3 credit hours)

PHM 3715 Management and Policy Concepts in Public Health (3 credit hours)

**For Accelerated Masters 4+1 Program Information, contact:**

Jeanette Broshears

Senior Program Manager

McWilliams School of Biomedical Informatics

80 Fort Brown Street, RAC N2.200

Brownsville, Texas 78520

Telephone: 956-755-0678

Email: [Jeanette.L.Broshears@uth.tmc.edu](mailto:Jeanette.L.Broshears@uth.tmc.edu)

## **Master of Science (MS) in Biomedical Informatics Program**

### **Program Description and Goals**

The formal study of informatics at the master's level is designed as a multi-disciplinary approach to accomplish these important goals:

1. Understand the scope of the discipline of Biomedical Informatics;
2. Demonstrate knowledge of the literature of Biomedical Informatics;
3. Develop informatics solutions to biomedical problems based on current research; and,
4. Utilize Electronic Health Records or other health information technologies effectively

### **Master of Science in Biomedical Informatics Admission Process**

The applicant should present a completed application and official documentation of the following:

1. A baccalaureate degree or higher
2. Official transcripts from all colleges and universities attended
3. Goal Statement – follow template instructions in application
4. A resume or curriculum vitae (as appropriate)
5. Three letters of reference from educators and/or employers
6. Students with international college transcripts must submit a course by course evaluation report by either World Education Services or Educational Credential Evaluators.
7. For International Applicants: A minimum TOEFL score of 94 is acceptable on the internet-based test. A minimum acceptable score for the IELTS is a 7.

Applicant materials will be reviewed by the McWilliams School of Biomedical Informatics Admissions, Progression and Graduation (APG) Committee. The committee will consider such areas as:

- Health, MIS, Computer, or Engineering related degree
- Healthcare work experience
- Database work experience
- Informatics work experience
- Demonstrated expertise in programming
- GPA in previous degree
- Success in overcoming social, economic or educational disadvantages, race and ethnicity

### **Requirements for International Applicants**

- The [Test of English as a Foreign Language \(TOEFL\)](#) or the [International English Testing System \(IELTS\)](#). For admissions consideration a minimum acceptable score of 94 on the internet-based TOEFL is required or a minimum acceptable overall score of 7.0 on the IELTS is required. Test scores are valid for two years from the test date. The official scores must be submitted directly to GradCAS from the applicable test center. Submit official TOEFL scores by using the reporting code B886; no department code is required. Submit official IELTS scores by sending them to GradCAS; no code is needed. Testing is at the applicant's expense.

- International applicants who have received a diploma from a university at which English is the language of instruction are not required to submit an English Language exam. If this school is outside of an English-speaking country, evidence that indicates the language of instruction will need to be provided with your application such as a letter from the University on official letterhead.
- International applicants must submit official transcripts and a course-by-course education evaluation of all transcripts from all universities attended outside the United States. The application forms for such an evaluation may be obtained online from the service providers; Educational Credential Evaluators, Inc., [www.ece.org](http://www.ece.org) and World Education Services, [www.wes.org](http://www.wes.org). Only evaluations from ECE or WES will be accepted. The results of the evaluation must be submitted directly to the UTHealth Houston Office of the Registrar by the agency. The evaluation report is at the applicant's expense.
- F-1 sponsorship is available for students in the Master of Science Biomedical Informatics, Research Track program. Students on a F-1 student visa are not eligible to enroll in the Master of Science in Biomedical Informatics, Applied Track program.
- The I-20 form, required by the Department of Homeland Security (DHS) and the United States Citizenship and Immigration Services (USCIS), is prepared by UTHealth Houston and issued to qualified non-immigrant applicants who have been admitted and who have demonstrated financial ability to support their education. Upon acceptance, the non-immigrant student will be asked to provide financial and visa information so that the I-20 form may be completed. The student must submit the completed form to the American Embassy in his/her country of origin in order to receive a student visa or must otherwise be eligible for F-1 status in the U.S. Please contact the UTHealth Houston Office of International Affairs for information (713-500-3176, [utoiahouston@uth.tmc.edu](mailto:utoiahouston@uth.tmc.edu)).
- \*International applicants seeking F-1 sponsorship are not eligible for summer admission to the Master of Science in Biomedical Informatics.

**Master of Science in Biomedical Informatics application deadlines:**

Fall admission	July 1
Spring admission	November 1
Summer admission*	March 1

**Degree Requirements for the Master of Science in Biomedical Informatics**

**Academic Requirements**

Each student will develop a degree plan with written approval of their academic advisor. A signed [degree plan](https://sbmi.uth.edu/current-students/curriculum/) (<https://sbmi.uth.edu/current-students/curriculum/>) will be filed each academic year that includes the required and/or elective courses as specified for the student's MS program. A total of 39 semester credit hours for all courses in the degree plan must be completed prior to graduation. There are two tracks

within the Master's Program. Students should work with the McWilliams School of Biomedical Informatics Office of Academic Affairs and their advisor to assure they are taking courses in their desired focus area.

A student in the MS Program in Biomedical Informatics has up to eight years (24 semesters) from the time of entry to complete the required course work. A student who has not enrolled in two consecutive registration periods (including the summer session) must submit to the McWilliams School of Biomedical Informatics Office of Academic Affairs a Reentry Form and new goal statement signed by the student's advisor indicating approval for reentry to the program. A student who has not enrolled for three or more consecutive registration periods will be dismissed and must reapply for admission to the program and the School.

Each course with a BMI prefix in the Biomedical Informatics degree plan is a graduate-level course and should be passed with a grade of "B" or better. Students who earn a grade of "C" must retake the course, whether a required or elective course, and earn a grade of "B" or higher to continue on in their academic program. The course must be retaken the next semester the course is offered. The original grade of "C" will remain on the student transcript. All students who earn a grade of "C" will be placed on Academic Probation. Students are not permitted to earn more than two grades of "C". The third grade of "C" will result in dismissal from the school. The minimum grade point average (GPA) required for graduation is 3.0 on all courses.

A maximum of six credit hours of Directed Study can be applied toward the master's program.

### **Transfer Credit**

Transfer credit for equivalent graduate courses taken elsewhere may be awarded and used to meet degree requirements if their equivalency to a McWilliams School of Biomedical Informatics degree program course is approved through a Petition for Equivalency Credit (PEC). The maximum number of transferable semester credit hours is 12 for the master's program. Contact the McWilliams School of Biomedical Informatics Office of Academic Affairs for information.

Courses that are accepted at McWilliams School of Biomedical Informatics, through a dual or joint degree program, can only be transferred in if the grade earned in the course is a "B" or higher. Courses for which grades of less than "B" were earned will not be accepted for transfer. Courses must have been completed within the last five years to qualify. See "Five-Year Rule" on page 20.

Applicants who are presenting course work from universities or colleges outside the United States to meet admission or graduation requirements are referred to the section on International Applicants in this catalog for a listing of additional requirements.

### **Computer Requirement**

Every student is required to have reliable access to a computer that meets the minimum technical requirements. Students are encouraged to purchase a laptop that meets the minimum school requirements.

Computer requirements are listed on the website here: <https://sbmi.uth.edu/current-students/student-handbook/computer-requirements.htm> and are subject to change.

## **Curriculum for the Master of Science in Biomedical Informatics**

### **Research Track**

The curriculum of the research track for the Master of Science degree in Biomedical Informatics includes required didactic courses and a practicum. Didactic courses (lecture/discussion, demonstration and student laboratories) are presented to provide facts, concepts, and theories related to the techniques and procedures of Biomedical Informatics. The courses include instruction in basic informatics, research, advanced informatics and elective courses. The practicum is designed to give the students the opportunity to apply theory and techniques in the hospital, research, or private laboratory setting.

Each student will develop a degree plan with written approval of their academic advisor. A degree plan will be filed each academic year that includes the core and required courses as specified below:

- 18 semester credit hours in required courses
  - BMI 5300 Introduction to Biomedical Informatics (3 credit hours)
  - BMI 5310 Foundations of Biomedical Information Sciences I (3 credit hours)
  - BMI 5311 Foundations of Biomedical Information Sciences II (3 credit hours)
  - BMI 5352 Statistical Methods in Biomedical Informatics (3 credit hours)
  - BMI 6313 Scientific Writing in Healthcare (3 credit hours)
  - BMI 6000 Practicum in Biomedical Informatics (3 credit hours)
- 21 semester credit hours in elective courses (see school website for suggested concentration curriculum)

Changes to the degree plan must be approved in advance by the faculty advisor and the signed degree plan must be on file with the Office of Academic Affairs prior to course registration.

### **Applied Track**

The curriculum of the applied track for the Master of Science degree in Biomedical Informatics includes required didactic courses, a choice of elective and a practicum. Didactic courses (lecture/discussion, demonstration and student laboratories) are presented to provide facts, concepts, and theories related to the techniques and procedures of Biomedical Informatics. The courses include instruction in basic and applied informatics. The practicum is designed to give the students the opportunity to apply theory and techniques in the hospital, research, or private laboratory setting. Courses marked with a \* have a \$100 Course Fee. Courses marked with a \*\* have a \$50 Course Fee.

Each student will develop a degree plan with written approval from their academic advisor. A signed degree plan will be filed each academic year that includes the core and required courses as specified below:

- 36 semester credit hours in required courses
  - BMI 5300 Introduction to Biomedical Informatics (3 credit hours)
  - BMI 5301 The U.S. Healthcare System (3 credit hours)

## The University of Texas Health Science Center at Houston

- BMI 5305 Legal and Ethical Aspects of Health Informatics (3 credit hours)
  - BMI 5313 Found of Electronic Health Records & Clinical Information Systems (3 credit hours)\*
  - BMI 5315 Quality and Outcome Improvement in Healthcare (3 credit hours)
  - BMI 5317 Applied Data Management (3 credit hours)
  - BMI 5328 Systems Analysis and Project Management (3 credit hours)\*\*
  - BMI 5329 Workflow Process Modeling (3 credit hours)
  - BMI 5371 Business and Technical Communication (3 credit hours)
  - BMI 6316 Change Management in Health Informatics (3 credit hours)
  - BMI 6340 Health Information Visualization & Visual Analytics (3 credit hours)
  - BMI 6000 Practicum in Biomedical Informatics (3 credit hours)
- 3 semester credit hours in an elective course

Changes to the degree plan must be approved in advance by the faculty advisor and the signed degree plan must be on file with the Office of Academic Affairs prior to course registration.

### **Practicum in Biomedical Informatics**

Students in the Master of Science in Biomedical Informatics program must select an area of interest in which to apply the knowledge and skill gained during the didactic courses while participating in the required practicum course. Students must complete at least 24 credit hours in their master's program before participating in the practicum requirement. Students should work with the Practicum Coordinator for any necessary affiliation or program agreements with the practicum site, if agreements are not already in place. A practicum proposal must be submitted to the Practicum Coordinator by week three of the semester of enrollment in the practicum course, and it must be approved, in writing, by the student's Faculty Practicum Advisor.

Students can complete all required practicum credit hours during one semester or the course can be repeated for a maximum of 3 semester credit hours (for BMI 6000) to meet degree requirements. During the course of the semester(s), student must create weekly logs to chronicle their hours, tasks, and reflections on how the duties of the practicum relate to Biomedical Informatics courses taken. Once the student has logged all 135 contact hours and concluded all practicum projects, she or he must create an 18-page APA format, double-spaced capstone report that details the major project they completed during their practicum. This report, along with other deliverables, will be submitted in completion of the practicum. If the student receives an incomplete for practicum, the student will have the following semester to complete it or receive an "F". If students have any questions regarding the practicum, they can contact the Practicum Coordinator or the McWilliams School of Biomedical Informatics Office of Academic Affairs.

Additional information regarding the Practicum in Biomedical Informatics can be found online at:

<https://sbmi.uth.edu/current-students/practicum.htm>

**For further curriculum information, please contact:**

McWilliams School of Biomedical Informatics at UTHealth Houston  
Office of Academic Affairs  
7000 Fannin Street Suite 600

The University of Texas Health Science Center at Houston

Houston, Texas 77030

Telephone: (713) 500-3591

Email: [SBMIAcademics@uth.tmc.edu](mailto:SBMIAcademics@uth.tmc.edu)



## **Master of Science in Biomedical Informatics and Master of Public Health Dual Degree Program**

### **Program Description and Goals**

The Master of Science in Biomedical Informatics/Master of Public Health dual degree program combines the MS degree from the McWilliams School of Biomedical Informatics at UTHealth Houston with the MPH from the UTHealth Houston School of Public Health. The training and curriculum in the dual degree program will provide students and future leaders in public health with the necessary skills to be leaders in the field of Public Health Informatics. The dual degree program provides an integrated curriculum that includes a number of shared courses as well as a practicum experience.

Students in the dual degree program must be admitted separately to each UTHealth Houston school. Students must meet the requirements of each UTHealth Houston school for its respective degree. Admission to one program does not ensure admission to the other. Students in the dual degree program will receive a diploma from each degree program after meeting the individual requirements of each UTHealth Houston school. Admission does not have to be done at the same semester for each school, but must be done before reaching the maximum hours set by each school.

### **Master of Science in Biomedical Informatics Admission Process – MS/MPH Dual Degree Program**

The applicant should present a completed application and official documentation of the following:

1. A baccalaureate degree or higher
2. Official transcripts from all colleges and universities attended
3. Goal Statement – follow template instructions in application
4. A resume or curriculum vitae (as appropriate)
5. Three letters of reference from educators and/or employers
6. Students with international college transcripts must submit a course by course evaluation report by either World Education Services or Educational Credential Evaluators.
8. For International Applicants: A minimum TOEFL score of 87 is acceptable on the internet-based test. A minimum acceptable score for the IELTS is a 7.

Applicant materials will be reviewed by the McWilliams School of Biomedical Informatics Admissions, Progression and Graduation (APG) Committee. The committee will consider such areas as:

- Health, MIS, Computer, or Engineering related degree
- Healthcare work experience
- Database work experience
- Informatics work experience
- Demonstrated expertise in programming
- GPA in previous degree
- Success in overcoming social, economic or educational disadvantages, race and ethnicity

### Requirements for International Applicants

- The [Test of English as a Foreign Language \(TOEFL\)](#) or the [International English Testing System \(IELTS\)](#). For admissions consideration a minimum acceptable score of 94 on the internet-based TOEFL is required or a minimum acceptable overall score of 7.0 on the IELTS is required. Test scores are valid for two years from the test date. The official scores must be submitted directly to GradCAS from the applicable test center. Submit official TOEFL scores by using the reporting code B886; no department code is required. Submit official IELTS scores by sending them to GradCAS; no code is needed. Testing is at the applicant's expense.
- International applicants who have received a diploma from a university at which English is the language of instruction are not required to submit an English Language exam. If this school is outside of an English-speaking country, evidence that indicates the language of instruction will need to be provided with your application such as a letter from the University on official letterhead.
- International applicants must submit official transcripts and a course-by-course education evaluation of all transcripts from all universities attended outside the United States. The application forms for such an evaluation may be obtained online from the service providers; Educational Credential Evaluators, Inc., [www.ece.org](http://www.ece.org) and World Education Services, [www.wes.org](http://www.wes.org). Only evaluations from ECE or WES will be accepted. The results of the evaluation must be submitted directly to the UTHealth Houston Office of the Registrar by the agency. The evaluation report is at the applicant's expense.
- F-1 sponsorship is available for students in the Master of Science Biomedical Informatics, Research Track program. Students on a F-1 student visa are not eligible to enroll in the Master of Science in Biomedical Informatics, Applied Track program.
- The I-20 form, required by the Department of Homeland Security (DHS) and the United States Citizenship and Immigration Services (USCIS), is prepared by UTHealth Houston and issued to qualified non-immigrant applicants who have been admitted and who have demonstrated financial ability to support their education. Upon acceptance, the non-immigrant student will be asked to provide financial and visa information so that the I-20 form may be completed. The student must submit the completed form to the American Embassy in his/her country of origin in order to receive a student visa or must otherwise be eligible for F-1 status in the U.S. Please contact the UTHealth Houston Office of International Affairs for information (713-500-3176, [utoiahouston@uth.tmc.edu](mailto:utoiahouston@uth.tmc.edu)).
- \*International applicants seeking F-1 sponsorship are not eligible for summer admission to the Master of Science in Biomedical Informatics.

### MS/MPH Dual Degree Program - Master of Science in Biomedical Informatics application deadlines:

Fall admission	July 1
Spring admission	November 1
Summer admission*	March 1

### **Transfer Credit**

Transfer credit is not accepted for students enrolled in the dual degree program due to the amount of shared credit hours between McWilliams School of Biomedical Informatics and SPH.

### **Shared Credit Hours**

Courses that are accepted at McWilliams School of Biomedical Informatics, through a dual or joint degree program, can only be transferred into the McWilliams School of Biomedical Informatics degree plan if the grade earned in the course is a “B” or higher. Courses for which grades of less than “B” were earned will not be accepted for transfer.

### **Dual Degree Requirements for the Master of Biomedical Informatics (MS) & Master of Public Health (MPH)**

#### **Academic Requirements**

Each student follows a degree plan developed with the Dual Degree Program Coordinator. A signed [degree plan](https://sbmi.uth.edu/current-students/curriculum/) (<https://sbmi.uth.edu/current-students/curriculum/>) will be filed each academic year that includes the required and/or elective courses as specified for the student’s Dual Degree program. A total of 40 semester credit hours must be completed prior to graduation.

A student in the dual degree MS/MPH Program in Biomedical Informatics has up to eight years (24 semesters) from the time of entry to complete the required course work. A student who has not enrolled in two consecutive registration periods (including the summer session) must submit to the McWilliams School of Biomedical Informatics Office of Academic Affairs a Reentry Form and new goal statement signed by the student’s advisor indicating approval for reentry to the program. A student who has not enrolled for three or more consecutive registration periods will be dismissed and must reapply for admission to the program and the School.

Each course with a BMI prefix in the Biomedical Informatics degree plan is a graduate-level course and should be passed with a grade of “B” or better. Students who earn a grade of “C” must retake the course, whether a required or elective course, and earn a grade of “B” or higher to continue on in their academic program. The course must be retaken the next semester the course is offered. The original grade of “C” will remain on the student transcript. All students who earn a grade of “C” will be placed on Academic Probation. Students are not permitted to earn more than two grades of “C”. The third grade of “C” will result in dismissal from the school. The minimum grade point average (GPA) required for graduation is 3.0 on all courses.

A maximum of six credit hours of Directed Study can be applied toward the MS in Biomedical Informatics program.

#### **Computer Requirement**

Every student is required to have reliable access to a computer that meets the minimum requirements. Students are encouraged to purchase a laptop that meets the minimum UTHouston requirements.

Computer requirements are listed on the website (<https://sbmi.uth.edu/current-students/student-handbook/computer-requirements.htm>) and are subject to change.

### **Curriculum for MS/MPH Dual Degree**

The curriculum for the Master of Science in Biomedical Informatics and the Master of Public Health include required didactic courses and a practicum. Didactic courses (lecture/discussion, demonstration and student laboratories) are presented to provide facts, concepts, and theories related to the techniques and procedures of public health courses, and support courses. The public health informatics practicum is designed to give the students the opportunity to apply theory and techniques in the hospital, research, community health agencies or private laboratory setting.

Each student will develop a degree plan with written approval of their faculty advisor. A degree plan will be filed that includes a minimum of:

- 34 semester credit hours in McWilliams School of Biomedical Informatics required courses (5 shared courses with SPH)
  - BMI 5300 Introduction to Biomedical Informatics (3 credit hours)
  - BMI 5310 Foundations of Biomedical Information Sciences I (3 credit hours)
  - BMI 5311 Foundations of Biomedical Information Sciences II (3 credit hours)
  - BMI 6313 Scientific Writing in Healthcare (3 credit hours)
  - BMI 6000 Practicum in Biomedical Informatics (3 credit hours)
  - PHM 1690 Introduction to Biostatistics in Public Health (4 credit hours)
  - PHM 2612 Epidemiology I (3 credit hours)
  - PHM 1110 Health Promotion and Behavioral Sciences in Public Health (3 credit hours)
  - PHM 3715 Management and Policy Concepts in Public Health (3 credit hours)
  - PHM 2110 Public Health Ecology and the Human Environment (3 credit hours)
- 9 semester credit hours in elective courses

Changes to the degree plan must be approved in advance by the faculty advisor and the signed degree plan must be on file with the Office of Academic Affairs prior to course registration.

<b>Program</b>	<b>Required Semester Credit Hours</b>
Master's in Biomedical Informatics (MS)	40
Master's in Public Health (MPH)	45
Total Semester Credits	85
Shared Courses	-25
<b>GRAND TOTAL FOR COMBINED DEGREES</b>	<b>60</b>

### **Practicum**

Students in the McWilliams School of Biomedical Informatics master's program must select an area of interest in which to apply the knowledge and skill gained during the didactic courses while participating in the required practicum course. Students must complete at least 24 credit hours in their master's program before participating in the practicum requirement. Students should work with the McWilliams School of Biomedical Informatics Practicum Coordinator for any necessary affiliation or program agreements with the practicum site, if agreements are not already in place. A practicum proposal must be submitted to the Practicum Coordinator by week three of the semester of enrollment in the practicum course, and it must be approved, in writing, by the student's Faculty Practicum Advisor. Students can complete all required practicum credit hours during one semester or the course can be repeated for a maximum of 3 semester credit hours (for BMI 6000) to meet degree requirements. During the course of the semester(s), student must create weekly logs to chronicle their hours, tasks, and reflections on how the duties of the practicum relate to Biomedical Informatics courses taken. Once the student has logged all 135 contact hours and concluded all practicum projects, she or he must create an 18-page APA format double spaced capstone report that details the major project they completed during their practicum. This report, along with other deliverables, will be submitted in completion of the practicum. If the student receives an incomplete for practicum, the student will have the following semester to complete it or receive an "F". If students have any questions regarding the practicum, they can contact the Practicum Coordinator or the McWilliams School of Biomedical Informatics Office of Academic Affairs.

### **For MS/MPH Dual Degree Program Information, contact:**

Jeanette Broshears  
Senior Program Manager  
McWilliams School of Biomedical Informatics  
80 Fort Brown Street, RAC N2.200  
Brownsville, Texas 778520  
Telephone: 956-755-0678  
Email: [Jeanette.L.Broshears@uth.tmc.edu](mailto:Jeanette.L.Broshears@uth.tmc.edu)

## **Doctor of Medicine (MD) and Master of Science in Biomedical Informatics (MS) Dual Degree Pathway Program**

### **Program Description and Goals**

The MD/MS Dual Degree pathway program is for students aiming to be both physicians and informaticians. Through this unique program, students earning a Doctor of Medicine (MD) also study at McWilliams School of Biomedical Informatics at UTHealth Houston and earn a Master of Science in Biomedical Informatics during their four years of medical school.

Our school collaborates with three different medical schools to offer the dual degree:

- McGovern Medical School at UTHealth Houston
- University of Texas Rio Grande Valley (UTRGV) School of Medicine
- Baylor College of Medicine

Dual Degree students will explore the wide range of applications of health and biomedical informatics in the quest to improve patient care. The program examines both electronic health records systems and clinical decision support systems and methods for enhancing those tools. Students learn about data interpretation and knowledge management as they discover how to collect, process, and transform health and biomedical data into health information and knowledge. Dual Degree students will understand core clinical informatics disciplines such as technology assessment, quality and outcome improvement, data analytics and precision medicine.

Students in the dual degree program must satisfy admission requirements and be admitted separately to each program. Students must meet the requirements of each program for its respective degree. Admission to one program does not ensure admission to the other. Students in the dual degree program will receive a diploma from each degree program after meeting the individual requirements of each program. Admission does not have to be done at the same semester for each school but must be done before reaching the maximum hours set by each School.

### **Master of Science in Biomedical Informatics Admission Process – MD/MS Program**

The applicant should present a completed application and official documentation of the following:

1. Copy of Medical School admission letter if you are a new student with no Medical School enrollment, or if you are already enrolled in Medical School, a letter of good academic standing that includes the applicant's academic year of medical school.
2. Official Transcripts from all colleges and universities attended
3. Goal Statement – follow template instructions in application
4. A resume or curriculum vitae (as appropriate)
5. Three letters of reference from educators and/or employers
6. Students with international college transcripts must submit a course by course evaluation report by either World Education Services or Educational Credential Evaluators.
7. For International Applicants: A minimum TOELF score of 94 is acceptable on the internet-based test. A minimum acceptable score for the IELTS is a 7.

NOTE: F-1 students will be sponsored by the Medical School.

Applicant materials will be reviewed by the McWilliams School of Biomedical Informatics Admissions, Progression and Graduation (APG) Committee. The committee will consider such areas as:

- Health, MIS, Computer, or Engineering related degree
- Healthcare work experience
- Database work experience
- Informatics work experience
- Demonstrated expertise in programming
- GPA in previous degree
- Success in overcoming social, economic or educational disadvantages, race and ethnicity

### Requirements for International Applicants

- The [Test of English as a Foreign Language \(TOEFL\)](#) or the [International English Testing System \(IELTS\)](#). For admissions consideration a minimum acceptable score of 94 on the internet-based TOEFL is required or a minimum acceptable overall score of 7.0 on the IELTS is required. Test scores are valid for two years from the test date. The official scores must be submitted directly to GradCAS from the applicable test center. Submit official TOEFL scores by using the reporting code B886; no department code is required. Submit official IELTS scores by sending them to GradCAS; no code is needed. Testing is at the applicant's expense.
- International applicants who have received a diploma from a university at which English is the language of instruction are not required to submit an English Language exam. If this school is outside of an English-speaking country, evidence that indicates the language of instruction will need to be provided with your application such as a letter from the University on official letterhead.
- International applicants must submit official transcripts and a course-by-course education evaluation of all transcripts from all universities attended outside the United States. The application forms for such an evaluation may be obtained online from the service providers; Educational Credential Evaluators, Inc., [www.ece.org](http://www.ece.org) and World Education Services, [www.wes.org](http://www.wes.org). Only evaluations from ECE or WES will be accepted. The results of the evaluation must be submitted directly to the UTHealth Houston Office of the Registrar by the agency. The evaluation report is at the applicant's expense.
- F-1 sponsorship is available for students in the Master of Science Biomedical Informatics, Research Track program. Students on a F-1 student visa are not eligible to enroll in the Master of Science in Biomedical Informatics, Applied Track program.
- \*International applicants seeking F-1 sponsorship are not eligible for summer admission to the Master of Science in Biomedical Informatics.

**Master of Science in Biomedical Informatics – MD/MS Dual Degree Program application deadlines:**

Fall admission	July 1
Spring admission	November 1
Summer admission*	March 1

**MD/MS Program Application Process**

The application process for the Doctor of Medicine is determined by the McGovern Medical School at UTHealth Houston, the UTRGV School of Medicine, or Baylor College of Medicine, respectively. The application process for the Master of Science in Biomedical Informatics is determined by the McWilliams School of Biomedical Informatics.

**Transfer Credit**

Transfer credit is not accepted for students enrolled in the dual degree program due to the amount of shared credit hours between McWilliams School of Biomedical Informatics and the participating institution.

**Shared Credit Hours**

Courses that are being accepted at McWilliams School of Biomedical Informatics, through a dual or joint degree program, can only be transferred into the McWilliams School of Biomedical Informatics degree plan if the grade earned in the course is a “B” or higher. Courses for which grades of less than “B” were earned will not be accepted for transfer.

**MD/MS Program Requirements for the Master of Science in Biomedical Informatics**

**Academic Requirements**

Each student follows a degree plan developed with the guidance of the Office of Academic Affairs at McWilliams School of Biomedical Informatics. A signed [degree plan \(https://sbmi.uth.edu/current-students/curriculum/\)](https://sbmi.uth.edu/current-students/curriculum/) will be filed each academic year that includes the required and/or elective courses as specified for the student’s dual degree program. A total of 39 semester credit hours must be completed prior to graduation.

A student in the MD/MS Program in Biomedical Informatics has up to eight years (24 semesters) from the time of entry to complete the required course work. A student who has not enrolled in two consecutive registration periods (including the summer session) must submit to the McWilliams School of Biomedical Informatics Office of Academic Affairs a Reentry Form and new goal statement signed by the student’s advisor indicating approval for reentry to the program. A student who has not enrolled for three or more



consecutive registration periods will be dismissed and must reapply for admission to the program and the School.

Each course with a BMI prefix in the Biomedical Informatics degree plan is a graduate level, professional course and must be passed with a grade of “B” or better. Students must earn a grade of “B” or higher in all dual degree program courses, unless the course is graded on a Pass or Fail basis in which a grade of “Pass” must be earned. If a dual degree student earns less than a “B” in any required course, it must be retaken to continue in the program. A grade of “B” or higher must be earned on the second attempt to prevent dismissal from the program. The minimum grade point average (GPA) required for graduation is 3.0 on all BMI courses.

### **Computer Requirement**

Every student is required to have reliable access to a computer that meets the minimum requirements. Students are encouraged to purchase a laptop that meets the minimum UHealth Houston requirements. Computer requirements are listed on the website (<https://sbmi.uth.edu/current-students/student-handbook/computer-requirements.htm>) and are subject to change.

### **Curriculum for the MD/MS Master of Science in Biomedical Informatics Program**

The MD/MS program requires a minimum of 39 semester credit hours to earn the MS, including the completion of a practicum experience in the field of biomedical informatics. Students must complete 27 semester credit hours of McWilliams School of Biomedical Informatics coursework and 12 semester credit hours from the student’s MD program are accepted. The program curriculum for the MS degree includes:

- Five (5) required McWilliams School of Biomedical Informatics courses totaling 15 semester credit hours
  - BMI 5300 Introduction to Biomedical Informatics (3 credit hours)
  - BMI 5310 Foundations of Biomedical Information Sciences I (3 credit hours)
  - BMI 5311 Foundations of Biomedical Information Sciences II (3 credit hours)
  - BMI 6313 Scientific Writing in Healthcare (3 credit hours)
  - BMI 6000 Practicum in Biomedical Informatics (3 credit hours)
- Four (4) McWilliams School of Biomedical Informatics courses totaling 12 semester credit hours in the student’s unique informatics area of interest
  - Students will work with Office of Academic Affairs staff and McWilliams School of Biomedical Informatics faculty when selecting the courses to ensure that the elective courses meet program requirements.
- Three (3) to five (5) Medical School modules equaling 12 semester credit hours
  - Unique module lists for each Medical School are below.

**McGovern Medical School at UTHealth Houston Modules accepted by McWilliams School of Biomedical Informatics for the Dual Degree Pathway Program**

Doctoring 1 Module: History and Physical (MS Year 1) – 4 semester credit hours

Doctoring 2 Module: Longitudinal Clinical Experience (MS Year 1) – 4 semester credit hours

Doctoring 3 Module: Longitudinal Clinical Experience (MS Year 2) – 4 semester credit hours

**Total – 12 semester credit hours**

**UTRGV School of Medicine Modules accepted by McWilliams School of Biomedical Informatics for the Dual Degree Pathway Program**

MEDI 8117: Molecules to Medicine Module (MS Year 1) – 3 semester credit hours

MEDI 8119: Attack & Defense (Evidence Based Medicine) (MS Year 1) – 3 semester credit hours

MEDI 8111-01 & 8111-02: Medicine, Behavior & Society (MS Year 1 & 2) – 3 semester credit hours

MEDI 8511: Mind, Brain and Behavior (MS Year 2) – 3 semester credit hours

**Total – 12 semester credit hours**

**Baylor College of Medicine Modules accepted by McWilliams School of Biomedical Informatics for the Dual Degree Pathway Program**

MBPP2-Main: Patient, Physician and Society I (MS Year 1) – 1 semester credit hours

MBPP3-Main: Patient, Physician and Society II (MS Year 1) – 3 semester credit hours

Clinical Application of Basic Sciences: Evidence Based Medicine (MS Year 2) – 2 semester credit hours

Clinical Application of Basic Sciences: Business & Leadership in Medicine (MS Year 2) – 3 semester credit hours

Research and Populations in Medicine (MS Year 1) – 3 semester credit hours

**Total – 12 semester credit hours**

**Practicum**

Students in the Master of Science in Biomedical Informatics must select an area of interest in which to apply the knowledge and skill gained during the didactic courses while participating in the required practicum course. Students in the MD/MS program must complete at least 24 credit hours in their master's program before participating in the practicum requirement. Students should work with the Practicum Coordinator for any necessary affiliation or program agreements with the practicum site, if agreements are not already in place. A practicum proposal must be submitted to the Practicum Coordinator by week three of the semester of enrollment in the practicum course and it must be approved, in writing, by the student's Faculty Practicum Advisor. Students can complete all required practicum credit hours during one semester or the course can be repeated for a maximum of 3 semester credit hours (for BMI 6000) to meet degree requirements. During the course of the semester(s), student must create weekly logs to chronicle their hours, tasks, and reflections on how the duties of the practicum relate to Biomedical Informatics courses taken. Once the student has logged all 135 contact hours and concluded all practicum projects, she or he must create an 18-page, double spaced capstone report that details the major project they completed during their practicum. This report, along with other deliverables, will be submitted in completion of the practicum. If students have any questions regarding the practicum, they can contact the Practicum Coordinator or the Office of Academic Affairs.

**For further curriculum information, please contact:**

McWilliams School of Biomedical Informatics at UTHealth Houston  
Office of Academic Affairs  
7000 Fannin Street Suite 600  
Houston, Texas 77030  
Telephone: (713) 500-3591  
Email: [SBMIAcademics@uth.tmc.edu](mailto:SBMIAcademics@uth.tmc.edu)

## **Doctor of Pharmacy and Master of Science in Biomedical Informatics Dual Degree Pathway Program**

### **Program Description and Goals**

The PharmD/MS Dual Degree program is for students aspiring to be both pharmacists and informaticians. Through this unique program, students earning a Doctor of Pharmacy (PharmD) at the University of Texas at Austin (UT Austin) College of Pharmacy also study at McWilliams School of Biomedical Informatics at UTHealth Houston and earn a Master of Science in Biomedical Informatics during their four years of pharmacy school.

Dual Degree students will learn important skills focused on medication-related patient care and improved health outcomes. Students will discover the importance of informatics practices while managing medication-related information in electronic health records, pharmacy information systems, and other automated systems. The program will explore the benefits and limitations to information systems in a pharmacy practice, standards and regulation in the design and use of information systems in pharmacy practice, health information systems and automation technologies and their impact on the medication-use process, and evaluation of patient safety, clinician satisfaction, workflow and outcomes in pharmacy informatics practice.

Students in the dual degree program must satisfy admission requirements and be admitted separately to each program. Students must meet the requirements of each program for its respective degree. Admission to one program does not ensure admission to the other. Students in the dual degree program will receive a diploma from each degree program after meeting the individual requirements of each program. Admission does not have to be done at the same semester for each school but must be done before reaching the maximum hours set by each School.

### **Master of Science in Biomedical Informatics Admission Process – PharmD/MS Program**

The applicant should present a completed application and official documentation of the following:

1. Copy of UT Austin College of Pharmacy admission letter for new students, and for students already enrolled in UT Austin's College of Pharmacy, a letter of good academic standing that includes the applicant's academic year of pharmacy school.
2. Official Transcripts from all colleges and universities attended
3. Goal Statement – follow template instructions in application
4. A resume or curriculum vitae (as appropriate)
5. Three letters of reference from educators and/or employers
6. Students with international college transcripts must submit a course by course evaluation report by either World Education Services or Educational Credential Evaluators.
7. For International Applicants: A minimum TOELF score of 94 is acceptable on the internet-based test. A minimum acceptable score for the IELTS is a 7.

Applicant materials will be reviewed by the McWilliams School of Biomedical Informatics Admissions, Progression and Graduation (APG) Committee. The committee will consider such areas as:

- Health, MIS, Computer, or Engineering related degree
- Healthcare work experience
- Database work experience
- Informatics work experience
- Demonstrated expertise in programming
- GPA in previous degree
- Success in overcoming social, economic or educational disadvantages, race and ethnicity

### Requirements for International Applicants

- The [Test of English as a Foreign Language \(TOEFL\)](#) or the [International English Testing System \(IELTS\)](#). For admissions consideration a minimum acceptable score of 94 on the internet-based TOEFL is required or a minimum acceptable overall score of 7.0 on the IELTS is required. Test scores are valid for two years from the test date. The official scores must be submitted directly to GradCAS from the applicable test center. Submit official TOEFL scores by using the reporting code B886; no department code is required. Submit official IELTS scores by sending them to GradCAS; no code is needed. Testing is at the applicant's expense.
- International applicants who have received a diploma from a university at which English is the language of instruction are not required to submit an English Language exam. If this school is outside of an English-speaking country, evidence that indicates the language of instruction will need to be provided with your application such as a letter from the University on official letterhead.
- International applicants must submit official transcripts and a course-by-course education evaluation of all transcripts from all universities attended outside the United States. The application forms for such an evaluation may be obtained online from the service providers; Educational Credential Evaluators, Inc., [www.ece.org](http://www.ece.org) and World Education Services, [www.wes.org](http://www.wes.org). Only evaluations from ECE or WES will be accepted. The results of the evaluation must be submitted directly to the UTHealth Houston Office of the Registrar by the agency. The evaluation report is at the applicant's expense.
- F-1 sponsorship is available for students in the Master of Science Biomedical Informatics, Research Track program. Students on a F-1 student visa are not eligible to enroll in the Master of Science in Biomedical Informatics, Applied Track program.
- The I-20 form, required by the Department of Homeland Security (DHS) and the United States Citizenship and Immigration Services (USCIS), is prepared by UTHealth Houston and issued to qualified non-immigrant applicants who have been admitted and who have demonstrated financial ability to support their education. Upon acceptance, the non-immigrant student will be asked to provide financial and visa information so that the I-20 form may be completed. The student must submit the completed form to the American Embassy in his/her country of origin in order to receive a student visa or must otherwise be eligible for F-1 status in the U.S. Please contact the UTHealth Houston Office of International Affairs for information (713-500-3176, [utoiahouston@uth.tmc.edu](mailto:utoiahouston@uth.tmc.edu)).
- \*International applicants seeking F-1 sponsorship are not eligible for summer admission to the Master of Science in Biomedical Informatics.

**PharmD/MS Dual Degree Program - Master of Science in Biomedical Informatics application deadlines:**

Fall admission	July 1
Spring admission	November 1
Summer admission*	March 1

**PharmD/MS Program Application Process**

The application process for the Doctor of Pharmacy is determined by the University of Texas at Austin College of Pharmacy. The application process for the Master of Science in Biomedical Informatics is determined by McWilliams School of Biomedical Informatics at UTHealth Houston.

**Transfer Credit**

Transfer credit is not accepted for students enrolled in the dual degree program due to the amount of shared credit hours between McWilliams School of Biomedical Informatics at UTHealth Houston and the participating institution.

**Shared Credit Hours**

Courses that are being accepted at McWilliams School of Biomedical Informatics, through a dual or joint degree program, can only be transferred into the McWilliams School of Biomedical Informatics degree plan if the grade earned in the course is a “B” or higher. Courses for which grades of less than “B” were earned will not be accepted for transfer.

**PharmD/MS Program Requirements for the Master of Science in Biomedical Informatics**

**Academic Requirements**

Each student follows a degree plan developed with the guidance of McWilliams School of Biomedical Informatics Office of Academic Affairs. A signed [degree plan \(https://sbmi.uth.edu/current-students/curriculum/\)](https://sbmi.uth.edu/current-students/curriculum/) will be filed each academic year that includes the required and/or elective courses as specified for the student’s dual degree program. A total of 39 semester credit hours must be completed prior to graduation.

A student in the PharmD/MS Program in Biomedical Informatics has up to eight years (24 semesters) from the time of entry to complete the required course work. A student who has not enrolled in two consecutive registration periods (including the summer session) must submit to the McWilliams School of Biomedical Informatics Office of Academic Affairs a Reentry Form and new goal statement signed by the student’s advisor indicating approval for reentry to the program. A student who has not enrolled for three or more consecutive registration periods will be dismissed and must reapply for admission to the program and the School.

Each course with a BMI prefix in the Biomedical Informatics degree plan is a graduate level, professional course and must be passed with a grade of “B” or better. Students must earn a grade of “B” or higher in all dual degree program courses, unless the course is graded on a Pass or Fail basis in which a grade of “Pass” must be earned. If a dual degree student earns less than a “B” in any required course, it must be retaken to continue in the program. A grade of “B” or higher must be earned on the second attempt to prevent dismissal from the program. The minimum grade point average (GPA) required for graduation is 3.0 on all BMI courses.

### **Computer Requirement**

Every student is required to have reliable access to a computer that meets the minimum requirements. Students are encouraged to purchase a laptop that meets the minimum UTHouston requirements. Computer requirements are listed on the website (<https://sbmi.uth.edu/current-students/student-handbook/computer-requirements.htm>) and are subject to change.

### **Curriculum for the PharmD/MS Master of Science in Biomedical Informatics Program**

The PharmD/MS program requires a minimum of 39 semester credit hours to earn the MS, including the completion of a practicum experience in the field of biomedical informatics. Students must complete 27 semester credit hours of McWilliams School of Biomedical Informatics coursework and 12 semester credit hours from the student’s PharmD program are accepted by McWilliams School of Biomedical Informatics for the Dual Degree. Courses marked with a \*\* have a \$50 Course Fee.

The program curriculum for the MS degree includes:

- Five (5) required McWilliams School of Biomedical Informatics courses totaling 15 semester credit hours
  - BMI 5300 Introduction to Biomedical Informatics (3 credit hours)
  - BMI 5310 Foundations of Biomedical Information Sciences I (3 credit hours)
  - BMI 5311 Foundations of Biomedical Information Sciences II (3 credit hours)
  - BMI 6313 Scientific Writing in Healthcare (3 credit hours)
  - BMI 6000 Practicum in Biomedical Informatics (3 credit hours)
- Four (4) McWilliams School of Biomedical Informatics elective courses totaling 12 semester credit hours
  - BMI 5390 Methods in Pharmacy Informatics (3 credit hours)
  - BMI 5391 Synthesis in Pharmacy Informatics (3 credit hours)
  - BMI 5328 Systems Analysis and Project Management (3 credit hours)\*\*
  - The fourth course is the student’s choice of one of the following courses (minimum of 3 credit hours):
    - BMI 6316 Change Management in Health Informatics (3 credit hours)
    - BMI 6340 Health Information Visualization and Visual Analytics (3 credit hours)

- Five (5) UT Austin College of Pharmacy courses equaling 12 semester credit hours
  - PHM 295Q Drug Information & Evidence-Based Practice (2 credit hours)
  - PHM 295R Advanced Evidence-Based Practice (2 credit hours)
  - PHM 283L Health Behavior and Health Outcomes (2 credit hours)
  - PHM 384L Pharmacy and the U.S. Health Care System (3 credit hours)
  - PHM 394F Principles of Pharmacoeconomics and Pharmacy Management (3 credit hours)

### **Practicum**

Students in the Master of Science in Biomedical Informatics must select an area of interest in which to apply the knowledge and skill gained during the didactic courses while participating in the required practicum course. Students in the PharmD/MS program must complete at least 24 credit hours in their master's program before participating in the practicum requirement. Students should work with the Practicum Coordinator for any necessary affiliation or program agreements with the practicum site, if agreements are not already in place. A practicum proposal must be submitted to the Practicum Coordinator by week three of the semester of enrollment in the practicum course and it must be approved, in writing, by the student's Faculty Practicum Advisor. Students can complete all required practicum credit hours during one semester or the course can be repeated for a maximum of 3 semester credit hours (for BMI 6000) to meet degree requirements. During the course of the semester(s), student must create weekly logs to chronicle their hours, tasks, and reflections on how the duties of the practicum relate to Biomedical Informatics courses taken. Once the student has logged all 135 contact hours and concluded all practicum projects, she or he must create an 18-page, double spaced capstone report that details the major project they completed during their practicum. This report, along with other deliverables, will be submitted in completion of the practicum. If students have any questions regarding the practicum, they can contact the Practicum Coordinator or the Office of Academic Affairs.

### **For further curriculum information, please contact:**

McWilliams School of Biomedical Informatics at UTHouston  
Office of Academic Affairs  
7000 Fannin Street Suite 600  
Houston, Texas 77030  
Telephone: (713) 500-3591  
Email: [SBMIAcademics@uth.tmc.edu](mailto:SBMIAcademics@uth.tmc.edu)



## **Doctor of Philosophy (PhD) in Biomedical Informatics**

### **Program Description and Goals**

This program is designed to be a research-based multi-disciplinary program involving students with a variety of backgrounds. Students will work together in teams to research real clinical and biomedical health problems. They will gain both the scientific background for research and skills needed to address problems. The program is designed to meet the unique needs of each student by using a matrix curriculum plan with an advising committee to guide each student from admission through graduation. Each student must have a faculty academic advisor to guide each student through participation in research projects.

The PhD program in Biomedical Informatics is conceptualized and designed to be inherently multi-disciplinary and integrative. This means that the fundamental informatics concepts that transcend and apply to all traditional healthcare disciplines will be emphasized in the PhD program. This program will identify and teach the major informatics concepts that integrate and link diverse health disciplines.

The PhD program in Biomedical Informatics is constructed as a post-baccalaureate degree that not only addresses the knowledge and skills that the student brings at admission, but allows the student to build on previous knowledge and skills in order to attain the research focus needed for the completion of the PhD program in Biomedical Informatics.

Students admitted to the master's program can apply to the PhD program by meeting the same admission requirements as those who apply directly to the PhD program.

Formal study of informatics at the PhD level at McWilliams School of Biomedical Informatics at UTHealth Houston is designed to accomplish these major goals:

- Expand the scope of the discipline of Biomedical Informatics
- Demonstrate familiarity with the Biomedical Informatics research literature, including in-depth knowledge of a selected Biomedical Informatics research area.
- Research and evaluate new regions or domains in Biomedical Informatics
- Lead interdisciplinary teams in the search for solutions to Biomedical Informatics problems
- Effectively communicate research findings to peers and to practitioners who can use the research findings.

The PhD program is a 93-semester credit hour full-time program developed as a post baccalaureate program. Part-time enrollment requires written approval of the advisor and advising committee.

## Doctor of Philosophy in Biomedical Informatics Admission Process

The applicant should present a completed application and official documentation of the following:

1. A baccalaureate degree or higher
2. Official transcripts from all colleges and universities attended
3. A resume or curriculum vitae (as appropriate)
4. Three letters of reference from educators and/or employers.
5. A Graduate Record Exam (GRE) score. GRE waivers may be considered on a case-by-case basis, exemption criteria can be reviewed on the admissions requirement website. Official GRE test scores must be no more than five (5) years old.
6. Goal Statement – follow template instructions in application
7. Students with international college transcripts must submit a course by course evaluation report by either World Education Services or Educational Credential Evaluators.
8. For International Applicants: A minimum TOEFL score of 94 is acceptable on the internet-based test. A minimum acceptable score for the IELTS is a 7.
9. Interview with the McWilliams School of Biomedical Informatics Admissions, Progression and Graduation (APG) Committee by invitation only. Applicants will also complete a writing assessment as part of the interview process.

### Requirements for International Applicants

- The [Test of English as a Foreign Language \(TOEFL\)](#) or the [International English Testing System \(IELTS\)](#). For admissions consideration a minimum acceptable score of 94 on the internet-based TOEFL is required or a minimum acceptable overall score of 7.0 on the IELTS is required. Test scores are valid for two years from the test date. The official scores must be submitted directly to GradCAS from the applicable test center. Submit official TOEFL scores by using the reporting code B886; no department code is required. Submit official IELTS scores by sending them to GradCAS; no code is needed. Testing is at the applicant's expense.
- International applicants who have received a diploma from a university at which English is the language of instruction are not required to submit an English Language exam. If this school is outside of an English-speaking country, evidence that indicates the language of instruction will need to be provided with your application such as a letter from the University on official letterhead.
- International applicants must submit official transcripts and a course-by-course education evaluation of all transcripts from all universities attended outside the United States. The application forms for such an evaluation may be obtained online from the service providers; Educational Credential Evaluators, Inc., [www.ece.org](http://www.ece.org) and World Education Services, [www.wes.org](http://www.wes.org). Only evaluations from ECE or WES will be accepted. The results of the evaluation must be submitted directly to the UTHealth Houston Office of the Registrar by the agency. The evaluation report is at the applicant's expense.

- F-1 sponsorship is available for students in the PhD program.
- The I-20 form, required by the Department of Homeland Security (DHS) and the United States Citizenship and Immigration Services (USCIS), is prepared by UTHealth Houston and issued to qualified non-immigrant applicants who have been admitted and who have demonstrated financial ability to support their education. Upon acceptance, the non-immigrant student will be asked to provide financial and visa information so that the I-20 form may be completed. The student must submit the completed form to the American Embassy in his/her country of origin in order to receive a student visa or must otherwise be eligible for F-1 status in the U.S. Please contact the UTHealth Houston Office of International Affairs for information (713-500-3176, [utoiahouston@uth.tmc.edu](mailto:utoiahouston@uth.tmc.edu)).

**Doctor of Philosophy in Biomedical Informatics application deadlines:**

Fall admission	December 1
Spring admission	July 1

**PhD Application Review and Admission Process**

**Review by the Admissions, Progression, and Graduation (APG) Committee**

Applicant materials will be reviewed by the admissions committee. The admissions committee will review the materials and recommend whether applicants will be offered an interview - the next step in the PhD admissions process. The criteria that the committee considers are the same as for the master's program including prior research experience. Applicants who are recommended for an interview will be contacted by Office of Academic Affairs for scheduling.

**Interview**

Applicants who proceed to the next level of the admission process will be interviewed by McWilliams School of Biomedical Informatics faculty members. The interview will focus on the applicant's research goals and how they will be achieved in the PhD program. Applicants will also complete a writing assessment as part of the interview process.

**Faculty Governance Organization (FGO) Review and Recommendation**

All interviewed applicants will be presented and discussed at a Faculty Governance Organization meeting. An admission recommendation by the FGO will be made to the Associate Dean for Student, Faculty, and Community Affairs.

**Academic Advising**

The PhD Coordinator serves as the primary advisor until an Advising Committee and Committee Chair has been identified.

As a student progresses, he or she must identify an academic advisor. This person will serve as the Committee Chair. The Committee Chair (also known as mentor, PI, dissertation director, advisor) is a full-time member of the School of Biomedical Informatics faculty who works with the student to develop a research topic, helps formulate ideas and guides the progress of the dissertation. In some cases, although

rare, there is a Committee Co-Chair (principal research, co-advisor) who also advises the student. The Committee Chair should be identified during the first year or initial semester of the second year. The Change of Advisor Form (available on the Current Students section of the website) for changing the PhD Coordinator to the named advisor must be completed following identification of a Committee Chair.

The student, in consultation with his/her Committee Chair, will identify the other members of the Advising Committee. Committee members are those who have expertise in and inform the student's area of research, serve as a reader of the proposal and dissertation, and vote on the outcome of the qualifying exam, proposal defense and outcome of final dissertation. A minimum of three individuals must serve on the final Advising Committee. At least two members of this committee, including the Chair, must be full-time members of McWilliams School of Biomedical Informatics faculty.

Students are responsible for scheduling and planning meetings with their committee and meeting milestones defined by this catalog. Student course selection must be approved by the Committee Chair and appropriately documented on the PhD Degree Plan form (available on the McWilliams School of Biomedical Informatics Current Students section of the website). Students are encouraged to meet with their Advising committee during the course of each semester to discuss ongoing progress and formulate plans for acceptable academic progress.

### **Transfer Credit**

Transfer credit for equivalent graduate courses taken elsewhere may be awarded and used to meet degree requirements if their equivalency to a McWilliams School of Biomedical Informatics degree program course is approved through a Petition for Equivalency Credit (PEC). The maximum number of transferable semester credit hours is 36 for the PhD program. Contact the Office of Academic Affairs for information.

Courses that are being accepted at McWilliams School of Biomedical Informatics, through a dual or joint degree program, can only be transferred in if the grade earned in the course is a "B" or higher. Courses for which grades of less than "B" were earned will not be accepted for transfer. Courses must have been completed within the last five years to qualify. See "Five(5)-Year Rule" on page 20.

Students who are presenting course work from universities or colleges outside the United States to meet admission or graduation requirements are referred to the section on International Applicants in this catalog for a listing of additional requirements.

### **Financial Assistance**

McWilliams School of Biomedical Informatics offers scholarships for PhD students that include full tuition support during the first year of academic study. These competitive scholarships are limited and offered to the most qualified PhD program applicants. Graduate Research Assistantships and Student Teaching Assistantships are available on a case-by-case basis. Students must submit an application to be considered for these opportunities.

## **Degree Requirements for the Doctor of Philosophy in Biomedical Informatics**

### **PhD Academic Requirements**

A total of 93 semester credit hours must be completed prior to graduation. A full-time student in the PhD Program in Biomedical Informatics has up to eight years from the time of entry to complete the required coursework. Continuous enrollment is required unless approval from the advising committee is obtained. Each student will develop a degree plan with written approval of their academic advisor. A signed [degree plan](https://sbmi.uth.edu/current-students/curriculum/) (<https://sbmi.uth.edu/current-students/curriculum/>) will be filed each academic year that includes the required and/or elective courses as specified for the student's PhD program.

A maximum of six credit hours of Directed Study can be applied toward the PhD program.

### **Other Requirements**

In Residence Requirement: The term "in residence" refers to the requirement that a student completes 57 semester credit hours over the course of the program at UTHealth Houston. A student must fulfill his or her in residence requirement in order to receive a PhD degree from the School.

### **Curriculum for the Doctor of Philosophy in Biomedical Informatics Program**

The curriculum of the PhD degree in Biomedical Informatics includes required didactic courses and elective courses. Didactic courses (lecture/discussion, demonstration and student laboratories) are presented to provide facts, concepts, and theories related to the techniques, and procedures of Biomedical Informatics. They include instruction in basic informatics, research, advanced informatics and support courses. The elective courses are designed to give students the opportunity to apply theory and techniques in the hospital, research, or private laboratory setting.

### **Required Courses from School catalog**

The following courses are required for the PhD degree plan. Courses indicated with \* must be completed prior to the qualifying exam. Requirements for these courses can be met through concurrent enrollment at other institutions and/or by consent of the student's Academic Advisor.

BMI 5300 Introduction to Biomedical Informatics\* (3 credit hours)

BMI 5007 Methods in Health Data Science\* (3 credit hours)

BMI 5310 Foundations of Biomedical Information Sciences I\* (3 credit hours)

BMI 5311 Foundations of Biomedical Information Sciences II\* (3 credit hours)

BMI 5352 Statistical Methods in BMI\* (3 credit hours) or PHM 1690 Introduction to Biostatistics in Public Health\* (4 credit hours)

BMI 6319 Advanced Data Structures in Biomedical Informatics\* (3 credit hours)

BMI 7301 Grant Writing (3 credit hours)

BMI 7302 Theories and Frameworks for Biomedical Informatics Research\* (3 credit hours)

BMI 7303 Critical Review of Biomedical Informatics Literature Seminar\* (3 credit hours)

BMI 7304 Advanced Research Design for Biomedical Informatics\* (3 credit hours)

Advanced Level Statistics Course\* Not offered at McWilliams School of Biomedical Informatics – See Advisor for concurrent enrollment options. (3 credit hours)

The PhD Program requires at a minimum 93 semester hours of study including 9 semester hours in preceptorship courses, 21 credit hours in a specific research area approved by the advisor, 3 credit hours of research seminar and 9 semester hours dedicated to the dissertation.

### **Progression**

Each year, students will be reviewed by the faculty to determine if adequate progress in the program has been made. This review is facilitated by the completion of annual Individualized Development Plans (IDP). It is the student's responsibility to maintain and update this plan in cooperation with their advisor. IDPs are filed annually with the Office of Academic Affairs. Failure to make adequate progress will result in action by the Admission, Progression and Graduation Committee. Action may include, but is not limited to additional review and monitoring of progress, changes in student standing (at risk, on probation, etc.) or dismissal from the program.

### **Qualifying Exam**

The goals of the PhD qualifying exam are:

1. To motivate students to review and synthesize course work and reported research
2. To determine the student's ability to understand and apply fundamental concepts
3. To develop and test the student's ability to communicate orally and to respond to questions and comments
4. To evaluate the student's potential to pursue doctoral research
5. To identify areas needing strengthening for the student to be successful as a PhD student and independent scholar
6. To provide a mechanism for faculty to come to know the student's capabilities

Students should prepare for a comprehensive qualifying exam within the semester following their sixth completed full-time semester or after completion of their 48th semester credit hour. The plan for the qualifying exam will be developed in conjunction with the academic advisor. The qualifying exam consists of demonstration of competency with both:

#### *Domain Specific Knowledge*

Demonstration knowledge, understanding, and proficiency in domain specific content and methodology. One of the purposes is to challenge students to discover relevant literature and deepen their knowledge of interests within this track.

#### *Breadth of Knowledge across the discipline*

Demonstrate breadth of knowledge across health sciences disciplines through questions that require synthesis of knowledge from core areas.

### General Structure of the Exam

1. Topics for the exam will include materials covered in the Core Courses (indicated by \*) and materials selected within a specific domain. The domain specific reading list will be developed in conjunction with the Committee Chair/Advising Committee.
2. Students will complete a written exam including both domain general and domain specific questions.
3. In addition to the exam, students will prepare a proposal abstract (1-2 pages) and deliver a public presentation of this abstract.
4. Following the written exam and public presentation, the student, Advising Committee, and PhD Qualifying Exam Committee will take part in a closed question and answer session (1-2 hours) over the written exam and public presentation.

Submission deadlines related to materials related for the qualifying exam (e.g. reading list, abstract/proposal to committee) will follow a set timeline following the student's declaration of intent. All components of the qualifying exam must be attempted within 30 days.

The qualifying exam dossier will contain the following items:

- a) Research project abstract
- b) Preliminary dissertation proposal (one to two pages, demonstrating knowledge and work of the student and others, synthesized to present a rationale for the proposed dissertation topic (e.g., theory to be developed, hypotheses to be tested) as well as proposed methodology to fulfill the dissertation objective.)
- c) List of references (30-50 articles) and syllabi for relevant classes for three domain areas related to their proposed research. Students should discuss these areas with their advisor in the process of planning their graduate program and prior to preparation of their qualifying exam materials.
- d) Current CV
- e) All previously completed Individualized Development Plans

Grading: The Advising Committee will assign one of the following grades to the overall qualifying exam:

- a) Pass unconditionally
- b) Pass conditionally (Advising Committee together with the PhD Qualifying Exam Committee to specify the conditions needed to pass, such as remedial coursework needed)
- c) Fail with option to retake
- d) Fail without option to retake

A student must be successful on each element of the progression exam to achieve pass unconditionally. The Advising Committee decision, together with the PhD Qualifying Exam Committee decision, will determine the specific requirements for options of a conditional pass or options to retake (e.g. retake the written and the oral, oral only, remediate with additional coursework.) Students with a score equivalent to "Fail with Option to Retake" for 4 or more graded sections of the qualifying exam will automatically fail the exam. The qualifying exam is composed of a total of 7 graded sections: 3 domain specific questions, 3 general informatics questions and oral exam.

If given the option to retake, students will be allowed to retake any specified portion of the exam once. Efforts to retake the progression sequence must be completed within 12 weeks. Failure to progress after this point will result in dismissal from the program.

### **Advanced Preceptorship**

Advanced Preceptorship is required for all PhD students. During Advanced Preceptorship, the student will develop and prepare his or her Advance to Candidacy Proposal including: defining the proposed research agenda; a review of the literature; research design, procedure and data analysis; collecting preliminary data; and scientific contribution to the discipline. The student's primary advisor and advising committee must approve the focus of the research. Students must successfully pass their Qualifying Exam prior to registering for Advanced Preceptorship hours.

### **Advancement to Candidacy**

Admission to the PhD program does not constitute or guarantee a student's admission to candidacy for the PhD degree. Within two full-time semesters or completion of 18 semester credit hours after completion of the qualifying exam, each student must submit an advance to candidacy proposal and give an oral presentation of their completed and proposed work to their Advising Committee. Successful advance to candidacy proposal defense includes approval of both the written proposal and its oral presentation. The oral presentation is open to the public and the candidacy proposal is only disseminated to the student's advising committee. Approval of the advance to candidacy proposal is required for continued progress towards the degree and designation as a doctoral candidate.

A student passes their advance to candidacy proposal defense if the majority of their Advising Committee votes to pass and the student's primary advisor votes to pass. In the event of a tie, the Associate Dean for Academic and Curricular Affairs will break the tie. If the Associate Dean for Academic and Curricular Affairs is on the committee, the Committee Chair will break the tie. If the Associate Dean for Academic and Curricular Affairs is the Committee Chair, the Dean will break the tie. If the student passes, he or she is admitted to candidacy. If the student does not pass, the Advising Committee can recommend failure without another attempt or failure with the opportunity to re-defend within 30 days. If the student again does not pass the defense, he or she will be given the option of completing a Master of Science in Biomedical Informatics degree, but will otherwise be dismissed from the doctoral program.

### **Dissertation**

The faculty believes that communication and dissemination is a critical aspect of the research process. The student will have two options available for the dissertation. The first option will consist of three articles that are accepted for publication. Publication must be in journals or proceedings, which are both peer-reviewed and indexed for academic retrieval. The three papers are combined with an introduction and summary and bound as a dissertation. The second option requires the student to write a monograph or dissertation. The monograph will review the literature, research approaches and options, the data design and gathering processes. The findings and data will be discussed in the context of the published literature. The monograph will be bound.



The dissertation must be presented at an oral defense that is open to the public. All research papers, theses, and dissertations authored by degree candidates are available to interested members of the general public upon request. After the presentation, the student's Advising Committee votes to award the degree, allow for re-defense of the dissertation within 30 calendar days of the failed attempt, or dismiss the student from the program without a degree.

### **Petitioning for Extension**

Students who have exceeded their time to degree deadline or a milestone deadline for the qualifying exam or prospectus may petition APG for an extension. The Petition to Extend Time Boundary for Qualifying Exam, Advance to Candidacy or Dissertation Defense form can be found under the Current Student section of the school website.

### **For further curriculum information, contact:**

McWilliams School of Biomedical Informatics at UTHealth Houston  
Office of Academic Affairs  
7000 Fannin Street Suite 600  
Houston, Texas 77030  
Telephone: (713) 500-3591  
Email: [SBMIAcademics@uth.tmc.edu](mailto:SBMIAcademics@uth.tmc.edu)

**Doctor of Philosophy (PhD) in Biomedical Informatics and Master of Public Health (MPH)  
Dual Degree Pathway Program**

**Program Description and Goals**

The PhD/MPH dual degree pathway program combines the PhD degree from McWilliams School of Biomedical Informatics at UTHealth Houston with the MPH from UTHealth Houston School of Public Health. The training and curriculum in the dual degree program will provide students and future leaders in public health the necessary skills to be leaders in the field of public health informatics. The MPH/PhD program provides an integrated curriculum that includes a number of shared courses as well as a practicum experience and/or the thesis topic in the area of public health informatics. The selection of specific academic programs and scheduling of specific courses, fieldwork, and practica for individual students is guided by an academic advisor from McWilliams School of Biomedical Informatics and an advising committee, which can include faculty from both UTHealth Houston schools.

The PhD part of the program in Biomedical Informatics is conceptualized and designed to be inherently multi-disciplinary and integrative. This means that the fundamental informatics concepts that transcend and apply to all traditional healthcare disciplines will be emphasized in the PhD program. This program will identify and teach the major informatics concepts that integrate and link diverse health disciplines.

The PhD program in Biomedical Informatics is constructed as a post-baccalaureate degree that not only addresses the knowledge and skills that the student brings at admission, but allows the student to build on previous knowledge and skills in order to attain the research focus needed for the completion of the PhD program in Biomedical Informatics.

Formal study of informatics at the PhD level at UTHealth Houston is designed to accomplish these major goals:

- Expand the scope of the discipline of Biomedical Informatics
- Demonstrate familiarity with the Biomedical Informatics research literature, including in-depth knowledge of a selected Biomedical Informatics research area.
- Research and evaluate new regions or domains in Biomedical Informatics
- Lead interdisciplinary teams in the search for solutions to Biomedical Informatics problems
- Effectively communicate research findings to peers and to practitioners who can use the research findings.

Students in the MPH/PhD program must be admitted separately to each UTHealth Houston school. Students must meet the requirements of each UTHealth Houston school for its respective degree. Admission to one program does not ensure admission to the other. Students in the program will receive a diploma from each degree program after meeting the individual requirements of each UTHealth Houston school. Admission does not have to be done at the same semester for each school, but must be done before reaching the maximum hours set by each school.

<b>Program</b>	<b>Required Semester Credit Hours</b>
PhD in Biomedical Informatics (PhD)	93
Master's in Public Health (MPH)	45
Total Semester Credits	138
Shared Courses	-24
<b>GRAND TOTAL FOR COMBINED DEGREES</b>	<b>114</b>

### **MPH/PhD Application Process**

Students in the MPH/PhD program must be admitted separately to each UTHealth Houston school. The application process for the Master of Public Health is determined by the UTHealth Houston School of Public Health (SPH), so students must contact the SPH Student Affairs office for details. The application process for the Doctor of Philosophy in Biomedical Informatics is determined by the McWilliams School of Biomedical Informatics at UTHealth Houston. Refer to the standard PhD program application process.

### **Transfer Credit**

Transfer credit is not accepted for students enrolled in the dual degree program due to the amount of shared credit hours between McWilliams School of Biomedical Informatics and SPH.

### **Shared Credit Hours**

Courses that are accepted at McWilliams School of Biomedical Informatics, through a dual or joint degree program, can only be transferred into the McWilliams School of Biomedical Informatics degree plan if the grade earned in the course is a "B" or higher. Courses for which grades of less than "B" were earned will not be accepted for transfer.

### **Financial Assistance**

Financial assistance packages and research assistantships will be available to all students on a competitive basis to facilitate full-time doctoral education.

### **Degree Requirements for the Doctor of Philosophy in Biomedical Informatics**

Refer to page 56 of this catalog for the Degree Requirements, Curriculum, Required Courses, Core Competencies, Progression, Qualifying Exam, Advanced Preceptorship, Advancement to Candidacy, Dissertation, Petitioning for Extension policies for the PhD in Biomedical Informatics.

## **Doctorate in Health Informatics (DHI) Program**

### **Program Description and Goals**

The program is the nation's first advanced practice degree in health informatics. The DHI includes unique curriculum built for professionals seeking a terminal degree in the field of health informatics.

The degree is geared towards professionals with documented executive or management-level healthcare experience. This practice doctorate program provides informatics leaders with the advanced education required to translate evidence from original research, evaluate current practices, and utilize critical thinking to accelerate the adoption of best practices in clinical and healthcare organizations.

Instruction for the program is in a hybrid environment with more than 50% of the coursework taught online. After completing necessary didactic courses, DHI students must complete a large-scale translational project at a healthcare organization. Students work under advisor guidance while completing the project, so students have the opportunity to translate evidence from original research and accelerate the adoption of best health informatics practices.

The program goals are to help students:

- Assume leadership positions throughout the healthcare industry having integrated health informatics with organizational leadership and ethics.
- Design, implement and evaluate health information technology quality improvement projects in health care systems.
- Implement evidence-based practice to improve human health.
- Employ effective communication and collaboration skills to identify and implement best practices in health care delivery.

### **Doctorate in Health Informatics Admission Process**

The applicant should present a completed application and official documentation of the following:

1. A completed online GradCAS application with a \$38 application fee.
2. Official transcripts from every post-secondary school attended.
3. A baccalaureate or higher degree (master's degree preferred).
4. No minimum GPA requirement. Majority of successful applicants have a GPA of 3.0 or greater.
5. A resume or curriculum vitae.
6. For international applicants, a minimum TOEFL score of 94 is acceptable on the internet-based test. A minimum IELTS score is 7. F-1 sponsorship is not available for students in the DHI program.
7. Goal Statement – follow template instructions in application.
8. Proposed area of interest for translational practice project.
9. A Letter of Support from the healthcare organization willing to facilitate the translational practice project. The Letter of Support must be on the healthcare organization's official letterhead. The Letter of Support should not be from the same person as a Letter of Reference. The Letter of

Support should include background on the healthcare organization (including the indication of size and the type of activities), the area the institution expects the student to perform the project in, and whether or not the organization will provide any type of support (monetary or technical) for the applicant's project.

10. Three letters of reference from supervisors or colleagues. At least two letters should be from supervisors.
11. Interview with the McWilliams School of Biomedical Informatics Admissions, Progression and Graduation (APG) Committee by invitation only. Applicants will also complete a writing assessment as part of the interview process.

### **Doctorate in Health Informatics application deadline:**

Fall admission                      March 1

### **Transfer Credit**

Transfer credit for equivalent graduate courses taken elsewhere may be awarded and used to meet degree requirements if their equivalency to a McWilliams School of Biomedical Informatics degree program course is approved through a Petition for Equivalency Credit (PEC). The maximum number of transferable semester credit hours is 21 for the DHI program. Contact the Office of Academic Affairs for information.

Courses that are accepted at McWilliams School of Biomedical Informatics, through a dual or joint degree program, can only be transferred in if the grade earned in the course is a "B" or higher. Courses for which grades of less than "B" were earned will not be accepted for transfer. Courses must have been completed within the last five years to qualify. See "Five (5)-Year Rule" on page 20.

Students who are presenting course work from universities or colleges outside the United States to meet admission or graduation requirements are referred to the section on International Applicants in this catalog for a listing of additional requirements.

### **Degree Requirements for the Doctorate in Health Informatics**

#### **Academic Requirements**

Students without a master's degree in health informatics, or a related field, must complete 33 semester credit hours of didactic coursework before starting the DHI curriculum. Students who hold a master's degree in informatics can immediately start the 63-semester credit hour program.

A part-time student has up to ten years (30 semesters) from the time of entry to complete the required course work. Continuous enrollment is required unless approval is obtained.

Each course with a BMI prefix in the Biomedical Informatics degree plan is a graduate level, professional course and must be passed with a grade of "B" or better. Students must earn a grade of "B" or higher in all dual degree program courses, unless the course is graded on a Pass or Fail basis in which a grade of "Pass" must be earned. If a dual degree student earns less than a "B" in any required course, it must be retaken to continue in the program. A grade of "B" or higher must be earned on the second attempt to

prevent dismissal from the program. The minimum grade point average (GPA) required for graduation is 3.0 on all BMI courses.

Each student will develop a degree plan with written approval of their academic advisor. A signed [degree plan](https://sbmi.uth.edu/current-students/curriculum/) (<https://sbmi.uth.edu/current-students/curriculum/>) will be filed each academic year that includes the required and/or elective courses as specified for the student's DHI program.

### **Computer Requirement**

Every student is required to have reliable access to a computer that meets the minimum requirements. Students are encouraged to purchase a laptop that meets the minimum UTHouston requirements. Computer requirements are listed on the website (<https://sbmi.uth.edu/current-students/student-handbook/computer-requirements.htm>) and are subject to change.

### **Curriculum for the Doctorate in Health Informatics**

The DHI program requires a minimum of 63 semester credit hours to earn the degree, for applicants with a master's degree. This includes 30 semester credit hours of required courses and 33 semester credit hours of coursework focused on translational project advisement and evaluation and fellowship. Courses marked with a \* have a \$100 Course Fee. Courses marked with a \*\* have a \$50 Course Fee.

#### **30 semester credit hours in required courses from School catalog**

- BMI 5300 Introduction to Biomedical Informatics (3 credit hours)
- BMI 6305 Social Dynamics and Health Information (3 credit hours)
- BMI 6311 Leadership and Decision Making (3 credit hours)
- BMI 6316 Change Management in Health Informatics (3 credit hours)
- BMI 6324 Health Information Technology Policy (3 credit hours)
- BMI 6328 Value in the Data Eco-System (3 credit hours)
- BMI 7350 Scholarly Foundations of Advanced HI Practice (3 credit hours)
- BMI 7351 Evidence-based Health Informatics Practice (3 credit hours)
- BMI 7360 Advanced Project Management (3 credit hours)\*\*
- BMI 7361 Vendor Relations and Contract Negotiation (3 credit hours)

#### **33 semester credit hours required towards completion of the translational project**

- BMI 7170 Project Advisement (3 credit hours)
- BMI 7070 Fellowship in Health Informatics (21 credit hours)
- BMI 9950 Project Evaluation and Writing (9 credit hours)

For those entering the program with only a bachelor's degree, the program requires the completion of 96 semester credit hours of McWilliams School of Biomedical Informatics coursework. This includes 63

semester credit hours of required courses and 33 semester credit hours of coursework focused on translational project advisement and evaluation and fellowship.

**63 semester credit hours in required courses from School catalog**

- BMI 5300 Introduction to Biomedical Informatics (3 credit hours)
- BMI 5301 The U.S. Healthcare System (3 credit hours)
- BMI 5305 Legal and Ethical Aspects of Health Informatics (3 credit hours)
- BMI 5313 Found of Electronic Health Records & Clinical Information Systems (3 credit hours)\*
- BMI 5315 Quality and Outcome Improvement in Healthcare (3 credit hours)
- BMI 5317 Applied Data Management (3 credit hours)
- BMI 5328 Systems Analysis and Project Management (3 credit hours)\*\*
- BMI 5329 Workflow Process Modeling (3 credit hours)
- BMI 5371 Business and Technical Communication (3 credit hours)
- BMI 6316 Change Management in Health Informatics (3 credit hours)
- BMI 6340 Health Information Visualization & Visual Analytics (3 credit hours)
- BMI 6305 Social Dynamics and Health Information (3 credit hours)
- BMI 6311 Leadership and Decision Making (3 credit hours)
- BMI 6316 Change Management in Health Informatics (3 credit hours)
- BMI 6324 Health Information Technology Policy (3 credit hours)
- BMI 6328 Value in the Data Eco-System (3 credit hours)
- BMI 7350 Scholarly Foundations of Advanced HI Practice (3 credit hours)
- BMI 7351 Evidence-based Health Informatics Practice (3 credit hours)
- BMI 7360 Advanced Project Management (3 credit hours)\*\*
- BMI 7361 Vendor Relations and Contract Negotiation (3 credit hours)

**33 semester credit hours required towards completion of the translational project**

- BMI 7170 Project Advisement (3 credit hours)
- BMI 7070 Fellowship in Health Informatics (21 credit hours)
- BMI 9950 Project Evaluation and Writing (9 credit hours)

**Progression**

The DHI Progression Gates or Milestones are required tasks and assignments that must be completed, in a satisfactory manner, during each specified semester. Said Progression Gates are outlined in the DHI Progression Gates Canvas course. These Progression Gates include required attendance at all on campus DHI Visits/Seminars that take place in Houston or virtually, as needed.

Failure to complete ANY Progression Gate can result in a student being referred to McWilliams School of Biomedical Informatics Admissions, Progression & Graduate Committee for student review and potential disciplinary action. Students must resolve all outstanding milestones by the end of the next semester or they will be unable to enroll going forward.

All DHI Students must work with their Academic Advisor regarding any issues regarding Progression Gate completion.

## **Qualifying Exam**

The goals of the DHI qualifying exam are:

1. To motivate students to review and synthesize course work and reported evidence-based practice
2. To determine the student's ability to understand and apply fundamental concepts
3. To develop and test the student's ability to communicate orally and to respond to questions and comments
4. To evaluate the student's potential to pursue doctoral-level work
5. To identify areas needing strengthening for the student to be successful as a DHI student and informatics leader
6. To provide a mechanism for faculty to come to know the student's capabilities

Students should prepare for a comprehensive qualifying exam within the semester upon completion of the second summer semester or after completion of their 33rd semester credit hour. The plan for the qualifying exam will be developed in conjunction with the academic advisor.

The qualifying exam consists of demonstration of competency with both:

### Domain-Specific Knowledge

Demonstration knowledge, understanding, and proficiency in domain specific content and methodology. One of the purposes is to challenge students to discover relevant literature and deepen their knowledge of interests within this track.

### Breadth of Knowledge across the discipline

Demonstrate breadth of knowledge across health sciences disciplines through questions that require synthesis of knowledge from core areas.

## **General Structure of the Exam**

1. Topics for the exam will include materials covered in the Required Courses and materials selected within a specific domain. The domain specific reading list will be developed in conjunction with the Committee Chair/Advising Committee.
2. Students will complete a written exam including both domain general and domain specific questions.
3. In addition to the written exam, students will prepare their translational project proposal and deliver a public defense of the translational project proposal.
4. Following the written exam and public defense, the student, Advising Committee, and DHI Qualifying Exam Committee will take part in a closed question and answer session (1-2 hours) over the written exam and public defense.



Submission deadlines related to materials related for the qualifying exam (e.g. reading list, project proposal to committee) will follow a set timeline following the student's declaration of intent. All components of the qualifying exam must be attempted within 30 days.

The qualifying exam dossier will contain the following items:

- a) Written translational practice project proposal
- b) List of references (30-50 articles) for three domain areas related to their proposed translational project. Students should discuss these areas with their advisor in the process of planning their graduate program and prior to preparation of their qualifying exam materials.
- d) Current CV or resume
- e) All previously completed Individualized Development Plans

### Grading

The Advising Committee and DHI Qualifying Exam Committee will assign one of the following grades to the overall qualifying exam:

- a) Pass unconditionally
- b) Pass conditionally (Advising Committee together with the DHI Qualifying Exam Committee to specify the conditions needed to pass, such as remedial coursework needed)
- c) Fail with option to retake
- d) Fail without option to retake

A student must be successful on each element of the qualifying exam to achieve pass unconditionally. The Advising Committee decision, together with the DHI Qualifying Exam Committee decision, will determine the specific requirements for options of a conditional pass or options to retake (e.g. retake the written and the oral, oral only, remediate with additional coursework.)

If given the option to retake, students will be allowed to retake any specified portion of the exam once. Efforts to retake the progression sequence must be completed within 12 weeks. Failure to progress after this point will result in dismissal from the program.

Upon successful completion of all components of the Qualifying Exam, the DHI student will have advanced to Candidacy for the Doctorate in Health Informatics.

### **Translational Project**

The DHI culminates with a translational project and a project evaluation report. Students in the program will work on didactic courses and translational project work simultaneously. Students identify a project and primary advisor during the first semester of study and invite two additional committee members during the second semester.

The Project Advisement course is taken as the student works with an advisor and committee to prepare the project plan. At the end of the student's first year, a tentative timeline for the completion of the DHI

program and translational project must be submitted.

The translational project requires:

- Background and review of relevant literature/evidence
- Project overview
- Theoretical framework/logic model
- Purpose statement/significance of project
- Evaluation design, including return on investment
- Implementation/gather evidence
- Recommendations
- Future implications

After completing the translational project, the student must present the findings. The presentation must be presented at an oral session that is open to the public. Translational project documents authored by degree candidates are available to interested members of the general public upon request. After the presentation, the translational project committee votes to pass or fail the student. If the student passes and all other degree requirements are met, the translational project committee makes its recommendation for the degree to be awarded.

### **Petitioning for Extension**

Students who have exceeded their time to degree deadline or a milestone deadline for the qualifying exam or project defense may petition APG for an extension. The Petition to Extend Time Boundary for Qualifying Exam or Translational Practice Project Defense form can be found under the Current Student section of the school website.

### **For further curriculum information, please contact:**

McWilliams School of Biomedical Informatics at UTHealth Houston  
Office of Academic Affairs  
7000 Fannin Street Suite 600  
Houston, Texas 77030  
Telephone: (713) 500-3591  
Email: [SBMIAcademics@uth.tmc.edu](mailto:SBMIAcademics@uth.tmc.edu)

## Course Descriptions

(Course descriptions are not intended as an assurance or warranty of achievement of specific skills or knowledge.)

### **BMI 5001 Special Topics in Biomedical Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: Depending on instructor/topic - could require consent

This course provides a timely way to examine cutting-edge topics of interest to students and faculty. The varying content may include topics such as: technical writing in Biomedical Informatics, comparing knowledge use across disciplines, and computational knowledge methods in Biomedical Informatics. This course may be repeated as topics vary.

### **BMI 5004 Introduction to Clinical Healthcare**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Classroom instruction

Prerequisite: Consent of instructor

Lab Fee: \$30

This course will present a survey of modern American clinical health care for students without a health care background who are entering fields that interact with health care such as biomedical informatics, cancer biology, and translational science. It is not a health care system course and is not intended to teach students how to practice medicine. The course is not appropriate for students who have a health care background (e.g., international medical graduates). We will focus on how clinical health care is delivered, rather than on health care financing, administration, regulation or governance. Students will attend lectures and “mini rotations” during which they will visit operational health care settings including outpatient clinics (pediatric and adult), emergency departments, intensive care units, clinical research and surgical settings. Major medical specialties including pediatrics, emergency medicine, internal medicine, radiology, etc. are presented. Students will interact with a variety of clinical practitioners.

### **BMI 5007 Methods in Health Data Science**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: Prerequisite quiz and Consent of instructor

Lab Fee: \$30

The course introduces methods in health data science – defining the problem, accessing, and loading the data, formatting into data structures required for analysis. This course covers the basics of computational thinking to define a computational solution, methods to access healthcare data from variety of sources (EHR data, UMLS, Medline, etc.), and in different data formats. The students will apply methods for data wrangling and data quality assessments to structure the data for analysis. The students will be introduced

to basics of design and evaluation of algorithms and application of data structures for healthcare data. The course will use Python programming language and basic python libraries for data sciences such as numpy, scipy, matplotlib and pandas.

Students should expect a good amount of programming exercises for each week. This course is not an introduction to programming, and not a course to improve programming skills. Students are expected to have some experience with introductory / beginner level Python programming.

**BMI 5300 Introduction to Biomedical Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Lab Fee: \$30

This introductory graduate level survey course provides an overview of Biomedical Informatics and Health Information Technology and introduces the student to the major areas of the evolving discipline. The competencies for graduate education in the discipline are presented as well as the definitions of biomedical informatics. A systems framework for understanding informatics is also considered. The course focuses on the application of health information technology for healthcare delivery, education and research as well as the multidisciplinary nature of biomedical informatics. The knowledge and skills presented in this course will help the student progress to other more advanced or specialized courses throughout the curriculum since an understanding of health care, health information technology and recent governmental efforts is necessary in order to function in the biomedical informatics discipline.

**BMI 5301 The U.S. Healthcare System**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

This course will present a survey of the modern American health care system. The course will focus on the major pieces of legislation that serve as the foundation of the current U.S. health care structures. Topics in the course will include Medicare, Medicaid, and HIPAA, their impacts on financing, health care access and professional roles. The course will integrate current legislative actions, public concerns, implications, and discussions surrounding health care reform.

**BMI 5302 Introduction to Human Factors in Healthcare**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Lab Fee: \$30

The course covers human factors topics with focus on healthcare. The topics include basics of human computer interactions, design and evaluation of healthcare interfaces, and role of usability in patient safety. The students will evaluate design of healthcare systems, including EHR modules, health

information display (dashboards, health education material), social networks for health, mobile health (apps, sensors, wearables, and devices) and medical devices. The students will also develop functioning prototypes for healthcare design solutions.

**BMI 5303 Methods in Human Factors Engineering**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisites: BMI 5302

This course will introduce students to key methods employed in biomedical informatics and human factors research. Students will have the opportunity to explore and learn about differing techniques, methods and design considerations. Students will conduct different types of data collection, analysis, and interpretation using both quantitative and qualitative methods. Ethnography, task analysis, questionnaires/surveys, log analysis, and gaze behavior are some of the topics covered. Through user experience projects, as well as critical evaluation of existing work, students will gain insight into the strengths and limitations of each approach.

**BMI 5304 Advanced Database Concepts in Biomedical Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: BMI 5007

Lab Fee: \$30

Database processing is a key area of competency in biomedical informatics. This course introduces the concepts and methods of database processing in the context of healthcare and biomedicine.

Topics covered include developing data models, designing, accessing and implementing databases, and database web access. We will cover relational databases (SQL), XML, no-SQL databases, ontologies and introduction to public databases for biomedical information.

**BMI 5305 Legal and Ethical Aspects of Health Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based instruction

Lab Fee: \$30

Biomedical Informatics involves rapidly changing technology, which impacts the way in which legal and ethical considerations are understood in our culture. This course will examine the relationships between law and ethics. Particular considerations will be given to the concepts of privacy, autonomy, responsibility and decision-making. These concepts will be discussed from both legal and ethical perspectives in the policy and regulatory arena. The impact of current and future technology, such as patient portals and social media, will be discussed as it relates to these concepts and the impact on Biomedical Informatics.

**BMI 5306 Security for Health Information Systems**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based instruction

This course will address security issues as they impact health information systems. Physical security of the hardware and software including redundancy, back up and restricted access will be discussed. Security and appropriateness of access will be addressed in terms of both hardware and software solutions. Data integrity, audit ability and system integrity will be considered along with the unique problems, such as the hacking of implantable devices, wired, wireless, and cellular networks, as well as the challenges of personally owned devices. Solutions to these concerns will be discussed in terms of industry standards, those that already exist, and those that are still evolving (i.e. Blockchain). Hands on experience with Splunk, a network security monitoring program. Features and functionality of Splunk include search, reporting, and analytics using machine data.

**BMI 5310 Foundations of Biomedical Information Sciences I**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: BMI 5300 or consent of instructor

Lab Fee: \$30

This course provides an overview of topics, concepts, theories and methods that form the foundations of biomedical information sciences. It gives students the fundamental knowledge and skills to pursue further study in biomedical informatics. Foundations I presents a general framework for computational models including symbolic and statistical approaches for solving problems throughout the range of biomedical science, from genetics to clinical care to public health. It covers concepts, theories and methods that deal with how biomedical information is acquired, discovered, represented, managed, organized, communicated, retrieved, and processed. It also provides an overview of the primary research and application areas in biomedical informatics.

**BMI 5311 Foundations of Biomedical Information Sciences II**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: BMI 5310

Lab Fee: \$30

This course provides an overview of theories and methods that are broadly applicable to all health informaticians. Students will be exposed to a variety of theories and frameworks needed to pursue study in biomedical informatics. In-demand skills such as working effectively in interprofessional teams, as well as creating and delivering an effective presentation will be demonstrated. This class will also present various informatics career paths for students.

**BMI 5313 Foundations of Electronic Health Records and Clinical Information Systems**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Lab Fee: \$30

Course Fee: \$100

This course is designed to provide informatics students with an overview of the key concepts regarding implementation of a clinically-oriented information system (e.g., an electronic medical record, computer-based provider order entry). The course will examine how health data are collected, how they are used and the impact of electronic records on the health data. The course will review standards, standards development, languages used, usability and issues related to information processing in health care. The course will review the impact of electronic records and patient portals on health and health care including, legal, financial, and clinical design issues. Challenges encountered during training and go-live will be discussed. Students will receive hands-on experience with an electronic health record in the training environment.

**BMI 5315 Quality and Outcome Improvement in Healthcare**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based instruction

Prerequisite: Basic statistics knowledge

This introductory course provides an overview to health care quality from the view of information science and the discipline of informatics. It takes a patient-centered approach that covers the complexities of quality and the scientific basis for understanding the measurement and improvement of quality, including exposure to multiple measures from a variety of organizations and measure comparison sites such as Medicare Compare. It provides the learner with a framework for key theories and concepts and models of quality improvement. Students will be introduced to health information technology safety issues, including tools for operationalizing HIT safety. Learners will be introduced to data quality, the challenges of data from devices and e-quality measures, as well as experience the challenge of calculating quality measures with data from the EHR. The merging of quality outcomes with evolving reimbursement paradigms and models will be examined.

**BMI 5317 Applied Data Management**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based instruction

Prerequisite: BMI 5300 or consent of instructor

Lab Fee: \$30

This course provides a broad foundation for health care data management. Students will develop a data model for a relational database, evaluate the quality of a variety of datasets, utilize common tools to produce actionable information from data, and develop and design processes for effective data and

information governance. After the introduction of key theories and concepts across these topics, students will complete hands-on projects.

**BMI 5327 Standards in Biomedical Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based instruction

Unlike much of the world, American health care standards are frequently developed by private organizations rather than the government. The Standards Development Organizations (SDOs) create an alphabet soup of organizations that are often not well known to people within health care, let alone those just entering the field. This course will explore the history of a variety of SDOs, examining their membership and focus domain. Students will examine the role of the major SDOs and their impact on the structure and function of health care delivery in the United States. The relationship between U.S. and international standards organizations will be reviewed.

**BMI 5328 Systems Analysis and Project Management**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based instruction

Course Fee: \$50

This course is an introduction to both systems analysis and project management. The student will have the opportunity to learn more about the approaches and tools available for systems analysis. Additionally, the student will learn more about the roles, responsibilities, and duties of a project manager. Moreover, the student will learn project management methods and the core activities of a project manager as well as the tools and techniques required to ensure the success of a large health care information technology project such as the implementation of a system or the evaluation of an existing system. Specific emphasis will be on training and support during go-live, total costing of projects, and explicit change management techniques.

**BMI 5329 Workflow Process Modeling**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based Instruction

Lab Fee: \$30

Students in this course will learn how to identify and assess different aspects of health care systems and health care workflow as well as how to evaluate a health information system. Students will learn the skills needed to assess and help improve workflow and the quality of health care delivery, with a special emphasis on optimization after implementation. Students will also be introduced to different methods of evaluation and how they would apply to health information systems, as well as the use of health information systems themselves.



**BMI 5330 Introduction to Bioinformatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: Consent of instructor

The course gives a comprehensive entry-level introduction to bioinformatics. It covers a wide variety of topics in bioinformatics, including but not limited to genome analysis, transcription profiling, protein structure and proteomics. Two major goals are 1) to help students understand the scope, basic concepts and theory of bioinformatics; and 2) to become familiar with tools for bioinformatics-related data analysis. Using software tools will be a major component of the course but advanced programming skills are not required. A laptop computer is necessary to use the bioinformatics software and tools in class and while performing the research tasks for the course project.

**BMI 5331 Foundations of Pharmacogenomics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: BMI 5330

Lab Fee: \$30

Pharmacogenomics is the study of how human genetic variation impacts drug response. It is one of the major promises of the genome project: that individual genetic information can be used to tailor drugs to patients, maximizing efficacy and minimizing adverse reactions. An understanding of pharmacogenomics requires dual understanding of the basics of genetics and genomics and of pharmacology. This course will provide the background to understand the current state and literature in pharmacogenomics, including the methods used in research and the current issues in discovery and implementation of pharmacogenomics.

**BMI 5332 Statistical Analysis of Genomic Data**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisites: BMI 5330 and BMI 5352

Lab Fee: \$30

This course provides students practical skills and statistical concepts and methods that underlie the analysis of high-dimensional genomic and Omics big data generated by high throughput technologies. It will also address issues related to the experimental design and implementation of these technologies. Lectures will often be delivered with live demonstrations. Students will engage in practical problem-solving sessions. The R language will be used for programming throughout the course.

**BMI 5333 Systems Medicine: Principles and Practice**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisites: Instructor Consent Required

Lab Fee: \$30

Systems medicine is an interdisciplinary field of study that looks at the systems of the human body as part of an integrated whole, incorporating biochemical, physiological, and environment interactions. Systems medicine draws on systems science, omics, imaging, systems biology, and considers complex interactions within the human body in light of a patient's genomics, behavior and environment, and design the precision medicine at systems level. Students will engage in hands-on projects exploring methods of systems medicine.

### **BMI 5334 Biomedical Data Privacy**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisites: Instructor Consent Required

Class limited to 20 students

The massive increase in the number of biomedical and health related datasets offer great opportunities for optimizing healthcare and understanding the molecular basis of diseases. These also bring novel challenges centered around protecting the privacy of consumers, patients, and their family members. Students will explore privacy preserving data analysis methods aimed at maximizing data utility while respecting the privacy of individuals. Foundational statistical methods that protect the privacy of individuals will be applied during hands-on exercises.

### **BMI 5351 Research Design and Evaluation in Biomedical Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisites: BMI 5300

Lab Fee: \$30

This course provides the student the opportunity to develop more advanced competencies in the design, analysis, interpretation and critical evaluation of experimental, quasi-experimental, pre-experimental and qualitative biomedical informatics research and evaluation studies. The student will identify flaws or weaknesses in research and evaluation designs, choose which of several designs most appropriately tests a stated hypothesis or controls variables potentially jeopardizing validity, and analyze and interpret research and evaluation results. Through exposure to the basic “building block” designs, students will have the opportunity to develop the competence to appropriately choose and use the most important and frequently used design procedures for single or multifactor research or evaluation studies.

**BMI 5352 Statistical Methods in Biomedical Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Lab Fee: \$30

This course provides the student the opportunity to develop essential competencies in the measurement, design, analysis, interpretation and critical evaluation of health, information, and behavioral science research and evaluation studies. Students will have the opportunity to learn and apply the most important and most frequently used statistical measures and methods, as well as critically evaluate their appropriate use. Topics include the study of frequency distributions, measures of central tendency, variance, hypothesis testing, correlation and both parametric and non-parametric inferential methods including t-tests, analysis of variance, chi-square, Kruskal-Wallis, Mann-Whitney, and Wilcoxon tests of significance, as well as tests of measures of association.

**BMI 5353 Biomedical Data Analysis**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: BMI 5007

Lab Fee: \$30

This course provides an overview of the data analysis process, with particular attention paid to the data quality issues encountered with biomedical data. The course will cover the entire data analysis pipeline from needs analysis to presentation of final results. The course is primarily project-based. The projects will cover a wide variety of biomedical data, including bioinformatics, clinical, public health, and literature datasets. Students will implement their analysis in Python and present their work in a variety of presentation formats.

**BMI 5354 Cognitive Engineering in Biomedical Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: BMI 5302 or consent of instructor

Lab Fee: \$30

This course focuses on cognitive engineering techniques for designing user-centered health information systems. Such systems provide appropriate functionality to the user, are easy to use and learn, reduce the chance of user error, and increase user efficiency. The course emphasizes how human cognitive abilities and limitations impose requirements on the design of effective interfaces. It covers the theory and practical application of several cognitive engineering techniques, including cognitive task analysis, verbal protocol analysis, propositional analysis and cognitive walkthroughs.

**BMI 5360 Clinical Decision Support Systems**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

This course is designed to provide an overview of decision support systems in health care, with a particular emphasis on design, evaluation and application of clinical decision support systems (CDSS) across all health care settings – in-patient, ambulatory care, long-term care, pharmacy, etc. The course explores the background and features of CDSS. Students will understand the mathematical foundations of knowledge-based systems, learn to identify areas which might benefit from a decision support system, evaluate the challenges surrounding development and implementation and consider issues of CDSS appropriateness and usability. The course also includes a detailed discussion of issues in clinical vocabularies and other important issues in the development and use of CDSS, and provides guidance on the use of decision support tools for patients. Students will have hands-on experience with EHR CDSS modification.

**BMI 5361 Informatics for Clinical Researchers**

2 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: Consent of instructor

This course will train the next generation of clinical researchers in the basics of clinical information systems (CIS). Students will be introduced to the skills needed to both use the data that is derived from these systems as well as understand the issues surrounding the design, development, implementation, and evaluation of CIS-based interventions.

**BMI 5371 Business and Technical Communication**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based instruction

Class limited to 15 students in Fall and Spring and 10 students in Summer

This course provides the advanced skills necessary to write a full range of business documents, including letters, memos, emails, technical and non-technical user guides, training documentation, system documentation, and application tip sheets. The reason for and appropriate uses of each of these types of documents will be examined. There will also be an introduction to scientific writing, which will be compared and contrasted with business and technical writing. The course presents techniques for producing high-quality business or technical writing. Students will apply these techniques by examining selected documents and published papers, producing their own writing, and critiquing the writing of others in class.

**BMI 5380 Principles and Foundations of Public Health Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Lab Fee: \$30

This course provides foundational knowledge relevant to Public Health Informatics (PHI), and exposes students to emerging research and application areas in this field. Topics covered include: public health registries and databases, surveillance systems, data exchange and standards, interoperability issues, the role of informatics in health promotion, use of web 2.0 informatics tools to understand behavior change, public health communication and dissemination, public health policy, and project management.

**BMI 5381 Methods in Public Health Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Lab Fee: \$30

This course introduces practical methods and techniques used in PHI. The course will focus on methods for evaluation of the effectiveness and efficiency of public health protection and delivery. The course modules are organized into four sub-domains of PHI methods: 1) theoretical frameworks, evaluation methods, and technological insights of digital behavior change support systems, 2) Legal and policy framework of PHI; 3) GIS and spatial analysis; and 4) Social network methods. The course is designed to familiarize students with methods for addressing the core concepts and issues confronting public health practitioners and researchers in planning, implementation and evaluation of information systems. Published articles will be used as reading assignments to complement class discussions and will provide with the background knowledge and practical context to understand and apply the concepts and the experiences from the class.

**BMI 5382 Synthesis Project of Public Health Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based instruction

Lab Fee: \$30

This course provides an opportunity for students to gain practical, hands-on cumulating knowledge and experience in PHI. This project should reflect a substantial effort and competency of synthesis in informatics developed through the course training that address core competencies of the PHI system by working through a problem of the student's choice. The selected problem should be discussed and approved by a faculty mentor. This should be tied to research/practice of a student's interest that includes one or more didactic modules covered in the prior courses. The synthesis project should be based upon the combined efforts of (online) library database search, fieldwork, and mentored research approved by the mentor(s). Expectations of the class include the presentation of the conclusions from the project in a written manner for academic dissemination as a conference abstract/poster.

**BMI 5390 Methods in Pharmacy Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based instruction

Methods for pharmacy informatics focuses on the opportunities and challenges in integrating information technology into contemporary pharmacy practice in acute and ambulatory settings. It is designed to introduce students to basic and practical informatics problems and solutions in pharmacy practice.

**BMI 5391 Synthesis Project in Pharmacy Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based instruction

This course provides an opportunity for students to gain practical, hands-on cumulating knowledge and experience in Pharmacy Informatics. This project should reflect a substantial effort and competency of synthesis in informatics developed through the course training that address core competencies of the pharmacy informatics system by working through a problem of the student's choice. The selected problem should be discussed and approved by a faculty mentor. This should be tied to research/practice of a student's interest that includes one or more didactic modules covered in the prior courses. The synthesis project should be based upon the combined efforts of (online) library database search, fieldwork, and mentored research approved by the mentor(s). Expectations of the class include the presentation of the conclusions from the project in a written manner for academic dissemination as a conference abstract/poster.

**BMI 6000 Practicum in Biomedical Informatics**

1-3 semester credit hours (variable hours/week)

Web-based and classroom instruction

Prerequisite: Consent of practicum coordinator

Course Fee: \$1,650

During the practicum, each student will select an area of interest in which to apply the knowledge and skills gained during the didactic courses. Students will become active participants in the work of developing informatics-based applications. Each student will develop a specific set of goals, to be approved by the student's advising committee and practicum supervisor, to be accomplished. These goals will reflect the student's area of interest and the needs of the organization. This course is graded on a pass/fail basis and is repeated for a maximum of three semester credit hours to meet degree requirements.

**BMI 6001 Special Topics in Biomedical Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: Depending on instructor/topic - could require consent

This course provides a timely way to examine cutting-edge topics of interest to students and faculty. The varying content may include topics such as technical writing in Biomedical Informatics, comparing

knowledge use across disciplines or computational knowledge methods in Biomedical Informatics. May be repeated as topics vary.

**BMI 6002 Directed Study in Biomedical Informatics**

1-6 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: Consent of instructor

This course provides a mechanism for students to explore issues of personal interest in the field of biomedical informatics. The varying content may include topics such as display of large-scale nursing data, mapping issues for dentistry or linking public health knowledge to clinical medicine. This course may be graded on a letter grade or pass/fail basis, and may be repeated as topics vary. Maximum allowed hours of BMI 6002: 3 hours maximum for certificate students and 6 hours for master's and doctoral students.

**BMI 6300 Advanced Health Information Systems**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: BMI 5007 and consent of instructor

Lab Fee: \$30

The course is a hands-on coverage of advanced health information technology, such as FHIR, SMART on FHIR, and CDS Hooks, with focus on implementation of the solution as an app. These advanced technologies solve the problems of implementing informatics solutions within existing systems such as EHRs, Decision Support Systems, Mobile Health, Consumer Health, etc. Students will develop an app as part of the course work.

**BMI 6301 Health Data Display**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based instruction

This course will examine the evaluation and design of information displays for health care. The course will focus on three areas: (1) Theories and methodologies for the evaluation of information displays; (2) Techniques and tools for generating effective information displays through visualization; and (3) How the formats of information displays affect decision making in health care.

**BMI 6303 Introduction to Telehealth**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: BMI 5300 or consent of instructor

Lab Fee: \$30

The course will provide an overview of telehealth in the context of the general health care system. It will survey the application of telehealth in various medical specialties and different settings, e.g., rural, military/aerospace and corrections. The course will identify key issues in implementing and operating a telehealth program, including technology, economics, law/ethics, training, protocol development, and evaluation.

**BMI 6305 Social Dynamics and Health Information**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based instruction

Prerequisite: BMI 5300 or BMI 5310 or consent of instructor

The implementation of information systems will not only greatly enhance the quality of health care but also radically change the nature of health care. This course will look at health care as a distributed system composed of groups of people interacting with each other and with information technology. Two major areas will be covered in the course. The first area is computer-supported cooperative work (CSCW), which is defined as computer-assisted coordinated activity such as reasoning, problem solving, decision-making, routine tasks and communication carried out by a group of collaborating individuals who interact with complex information technology. Most health information systems (such as EMR) are large group-ware that support large numbers of synchronous and asynchronous users with diverse backgrounds in the executions of many different types of tasks. The second area is the social impact of information technology. This area will focus on the impact of the Internet on health care, such as the functions and impacts of virtual communities, online health groups, and telehealth care through the web.

**BMI 6306 Information and Knowledge Representation in Biomedical Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: BMI 5304

Lab Fee: \$30

The purpose of this course is to examine the role of information representation, controlled vocabularies and knowledge engineering constructs such as ontologies in conceptualization, design and implementation of modern health information systems. The course will introduce approaches for representing information and knowledge in a distributed network of health information systems. Moving beyond a general understanding of taxonomies, students will gain an understanding of the conceptual foundations of ontologies, including the limitations of the modern systems. Knowledge modeling and engineering principals will be introduced through lectures, hands-on practice and the class project. This will include the design, construction and use of ontologies in health care applications. Through hands-on experience, students will gain insight into the strengths and limitations of the existing resources, approaches and systems as well as point to directions where future work needs to be done.



**BMI 6308 Digital Technologies and Analytics for Personalized Health**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisites: BMI 5300 or Concurrent Enrollment

Lab Fee: \$30

Digital technologies have been gaining popularity in personal health and wellness. A plethora of mobile and connected platforms, patient centered solutions are poised to transform the role of public, care providers, and health systems. The key driving forces of this digital era are personalized health data and advanced analytics. In this course, students will explore these key facets of digital health and learn to (a) apply text analytics and machine learning models to describe user needs in digital settings, (b) synthesize best practices and tools for optimizing and measuring user experiences in digital solutions, and (c) discuss the emerging trends in the field that have the potential to transform health care.

**BMI 6309 Healthcare Interface Design**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisites: BMI 5302 or BMI 5303 or consent of instructor

Lab Fee: \$30

This course is a project-based course, and covers topics of user interface design for healthcare related systems (such as EHR, clinical decision support system, dashboards). Students will apply the fundamental principles of human-computer interaction and human factors to real world problems through class projects, and will develop formal documentations of user-centered design process for interface design. The focus is executing a design project to develop user-friendly interfaces, and interfaces that are compliant with industry and government standards (e.g., FDA, CMS, NIST) for healthcare.

**BMI 6311 Leadership and Decision Making**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Lab Fee: \$30

Healthcare is challenging with a high degree of uncertainty, making decision making more complex. Leadership is fundamentally about getting things done through people, while decision making is the process behind choosing. In this course we will focus on how to lead, choose between alternatives, measure productivity, streamline process flows, and implement project plans in health/clinical informatics. We will incorporate theories behind uncertainty and decision modeling, and spend time assessing examples of both superior and inferior leadership in healthcare and health informatics.

**BMI 6313 Scientific Writing in Healthcare**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Lab Fee: \$30

This course provides the advanced skills necessary to write a full range of scientific manuscripts in Biomedical Informatics. The course begins with the philosophy of science, types of scientific research, and types of scientific manuscripts (including review, applied, and research articles). The course then examines each component of a scientific manuscript in detail, including the title, abstract, introduction, literature review, method, discussion, conclusion and appendices. The course covers the purpose of each of these components, discusses properties that distinguish good components from bad, and presents techniques for producing high-quality scientific writing. Students will apply these techniques by examining selected published papers, producing their own scientific writing, and critiquing the writing of others in the class. Students are expected to enter the class with a draft scientific paper that they have written and a high degree of general writing skills.

**BMI 6315 Advanced Electronic Health Records**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: BMI 5313 or consent of instructor

Lab Fee: \$30

This course is designed to provide informatics students with an in-depth overview of the key concepts regarding implementation of a clinically-oriented information system (e.g., an electronic medical record, computer-based provider order entry, nursing 5). The course will strive to present “best practices” in cases which there is evidence to support such assertions. The course will rely heavily upon the published literature as well as the experience of the instructors.

**BMI 6316 Change Management in Biomedical Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based

The ability to manage change - people, process, and technology - may be the most important factor in successful implementation and in producing sustained outcomes from applied health informatics projects. This course will cover the theory and principles of change management, with a particular emphasis on healthcare and information technology innovation at both the individual and organizational level. Tools and techniques for developing comprehensive change management plans will be presented. Case studies of successful and failed change efforts will demonstrate applications of these principles and techniques.

**BMI 6318 Big Data in Biomedical Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisites: BMI 5007 or consent of instructor

Lab Fee: \$30

This course will expose students to the technologies used to solve 'Big Data' problems in biomedicine and healthcare. Through hands-on exercises, we will learn how to distill actionable information from small and large data leveraging multiple machines. We will cover the data science toolboxes for processing data sets with distributed algorithms, how to apply machine learning models in this context and finally, evaluate and report on the analysis. Students will be required to complete hands-on exercises and working knowledge of Python and SQL is required.

### **BMI 6319 Data Analysis for Scientific Research in Biomedical Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Classroom instruction

Prerequisites: BMI 5007 or consent of instructor

Required for PhD students

Lab Fee: \$30

This course explores new and emerging data structuring problems within the context of healthcare. Advanced data structures are required for a variety of applications, including efficient database design, data mining, information retrieval and web search, among others. Students should be prepared to participate in a variety of programming assignments and complete a project related to their doctoral or other significant research area.

### **BMI 6322 Distributional Semantics: Methods and Biomedical Applications**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Classroom instruction

Prerequisite: BMI 5311 or consent of instructor

Lab Fee \$30

This course concerns computational methods that learn about the meaning of words and concepts from their distribution in natural language, and consequently are able to perform cognitive tasks in a human-like manner. For example, with the appropriate learning materials, these methods have shown performances comparable with English as a second language speakers on the Test of English as a Foreign Language synonym test. Applications in the biomedical domain include information retrieval, automated indexing of the biomedical literature, literature-based knowledge discovery and the analysis of biological sequences. This course will explore the underlying theories and various methodological approaches used to measure semantic relatedness (the extent to which the meaning of two terms is related), as well as their application in biomedical and other domains. The course will provide hands-on instruction so that students will emerge with the ability to apply the methods taught in the class in their own research.

### **BMI 6323 Machine Learning in Biomedical Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Lab Fee: \$30

The increased digitization of biomedical data has dramatically increased interest in methods to analyze large quantities of data. Data mining is the process of transforming this raw data into actionable knowledge, which has led to many spectacular advances in biomedicine. This course provides an introduction to data mining methods from a biomedical perspective. The primary focus will be on practical and commonly used machine learning techniques for data mining (e.g., decision trees, support vector machines, clustering) and how these techniques transform data into knowledge. Students will engage in hands-on projects that expose them to data mining methods. Further, students will be able to critically evaluate the appropriateness of data mining methods on different tasks.

This course is designed to accommodate students with a varying degree of technical skills. No programming experience is required.

### **BMI 6324 Health Information Technology Policy**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

This course will examine policy issues related to the use of information technologies in health care. It will examine key policies and policy issues in three areas: clinical informatics, consumer informatics and population health informatics. The primary focus will be on the United States, but international approaches will also be discussed.

### **BMI 6328 Value in the Health Data Eco-System**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: BMI 5300

This course will expose doctoral students to an interdisciplinary research area that aims to explore the challenges of improving health care delivery, and reducing costs in a health information technology-enabled environment. Data and information are assets and a strategic resource for an organization that can add value or cause major disruptions. An understanding of the relationships and use of data and its interdependencies are essential to manage an organization. Improving healthcare requires knowledge of the intersections between data systems and relationships, data governance, data definitions, representative metrics, evidence-based interventions and outcomes.

### **BMI 6330 Biomedical Natural Language Processing**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: Consent of instructor

This course will examine current natural language processing (NLP) methods and their applications in the biomedical domain. It will provide a systematic introduction to basic knowledge and methods used in NLP research and hands-on experience with existing biomedical NLP systems. Students will gain knowledge and skills in various NLP tasks such as named entity recognition, information extraction, and information retrieval.

**BMI 6331 Medical Imaging and Signal Pattern Recognition**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: BMI 5007

Lab Fee: \$30

Biomedical data in the form of images, videos or other unstructured signals are continuously collected by clinicians, such as radiologists, dermatologists or ophthalmologists, life science researchers and increasingly by ourselves with our personal devices. Tools able to distill quantitative actionable information from these data are essential to generate phenotypes, aid diagnosis, screening, treatment and automate repetitive tasks. In the era of personalized medicine and big data, they have become an urgent medical need. In this course, you will be introduced to the essential pattern recognitions techniques to build and evaluate such tools. We will be covering the basics of image/signal processing, computer vision and applied machine learning with hands on examples relevant to biomedical applications.

**BMI 6332 Genomics and Precision Medicine**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: BMI 5330 or instructor approval

Lab Fee: \$30

This course will provide the foundations of precision medicine and its relations with genomics by exposing trainees to the use and interpretation of genetic studies of human populations in the context of phenotypes and diseases. The course will cover principles of genetics underlying associations between genetic variants and disease susceptibility and drug response.

**BMI 6333 Current Topics in Genomics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Prerequisite: BMI 5330

Bioinformatics play significant roles in modern genetics and genomics studies. Nearly every large-scale biology projects require a significant component of bioinformatics and computational approaches. This

course provides an introduction to advanced technologies and resources in genetics, epigenetics, transcriptomics, and phenotype studies, organized as “topics”. Students will be provided with knowledge and skills to apply canonical algorithms in bioinformatics tasks, to identify potential challenges, and to develop their own analysis pipelines.

**BMI 6334 Deep Learning in Biomedical Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3 Web-based and classroom instruction

Prerequisite: BMI 5007 and BMI 5353 or Instructor Consent

Lab Fee: \$30

Deep learning and artificial intelligence have disrupted multiple industries including healthcare. This class offers students exposure to basic concepts of and practical skills for deep learning and its applications in selected problems in biomedical informatics. Students will study the foundations of deep learning, understand how to build neural networks, and conduct successful machine learning analyses. Deep learning architectures such as convolutional neural networks, recurrent neural networks, and autoencoders will be explored, along with concepts such as embeddings, dropout, and batch normalization. Case studies from biomedical informatics, including biomedical and clinical natural language processing, medical imaging, electronic health records, and genomics data will be utilized. Students will use the Python language and the state-of-the-art deep learning frameworks to implement deep learning models to solve real world problems. Experience with Python programming and basic knowledge of linear algebra is required.

**BMI 6340 Health Information Visualization & Visual Analytics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based and classroom instruction

Lab Fee: \$30

This course introduces the basics of information visualization, which is the use of interactive visual representations of data to amplify human cognition. Properly constructed visualizations allow us to analyze data by exploring it from different perspectives and using the power of our visual system to quickly reveal patterns and relationships. This course uses practical, hands-on examples and exercises to teach the theory and application of information visualization for health data. The class emphasizes visual analysis of time-series data, ranking and part-to-whole relations, deviations, distributions, correlations, multivariate, and geographic data. You will also learn how to combine multiple visualizations into interactive dashboards and how to use Tableau, a state-of-the-art information visualization tool to produce and deliver visualizations and dashboards quickly and easily.

**BMI 6370 Advanced Standards and Terminologies in Nursing and Health Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based instruction

Prerequisite: Consent of instructor

Enrollment only open to DNP students

This course will explore the history of healthcare SDOs, examining their membership and focus domain. Students will examine the role of the major SDOs and their impact on the structure and function of global healthcare delivery. The relationship between US and International Standards Organizations will be reviewed. Furthermore, the course will explore emerging standards. Additionally, students will have the opportunity to compare and contrast nursing terminologies and classification systems relevant to the Electronic Health Record (EHR). Students will create a nursing standard for implementation in an electronic health record (EHR) and propose a method to evaluate the standard post implementation.

### **BMI 7000 Advanced Preceptorship**

1-9 semester credit hours (variable hours)

Prerequisite: Consent of instructor & successful completion of the Qualifying Exam

Required for PhD students; may be repeated for up to 9 hours to meet the degree requirement

Enrollment only open to PhD students

The student will use this course to develop a research proposal that will be used as a basis for their doctoral dissertation. The student must complete nine semester credit hours with the supervision of the mentor or primary advisor. The result will be used to prepare for the advance to candidacy exam.

### **BMI 7050 Research in Biomedical Informatics**

1-9 semester credit hours (variable hours)

Prerequisites: Consent of instructor

Required for PhD students; must be repeated for up to 21 hours to meet the degree requirement

Enrollment is only open to PhD students after successful completion of the Advance to Candidacy.

The doctoral candidate must complete 21 hours of research in Biomedical Informatics. The mentor or primary advisor will supervise the advancement of the candidate's progress.

### **BMI 7070 Fellowship in Health Informatics**

1-9 semester credit hours (variable hours)

Prerequisites: Consent of instructor

Required for DHI students; must be repeated for up to 21 hours to meet the degree requirement

Enrollment only open to DHI students

DHI students will use this course to implement their translational practice project under the supervision of their primary advisor and in collaboration with their additional committee members. The translational practice project requirements will consist of background and review of relevant literature/evidence, project overview, theoretical framework/logic model, purpose statement/significance of project, evaluation design (including return on investment), implementation/gather evidence, recommendations and finally, future implications. This course must be repeated as students must earn a total of 21 semester credit hours to meet the degree requirement.

### **BMI 7150 Research Seminar**

1 semester credit hour

Prerequisite: Consent of instructor

Required for PhD students; must be repeated for up to 3 hours to meet the degree requirement

Enrollment only open to PhD students

This course involves the weekly research seminars in which both invited speakers and students present their work to an audience of McWilliams School of Biomedical Informatics affiliates. Students participating in the course for credit are required to both give a seminar presentation, attend at least 80% of the weekly seminars, and fill out evaluation forms available online). Each student seminar must be supervised by a faculty member (not necessarily the student's advisor). The faculty member will work with students to ensure that the seminars are both appropriate and interesting for the audience.

### **BMI 7151 Seminar in Precision Medicine**

1 semester credit hour

Lecture contact hours: 1

Prerequisite: Consent of instructor

Seminar in Precision Medicine will introduce and discuss recent advances, frontier technologies, case studies, and future direction in precision medicine. The topics cover precision medicine, bioinformatics, systems biology, pharmacogenomics, genetics, genomic medicine, study design, methodologies and computational tools. Students enrolled in the course for credit are required to give a seminar presentation, attend at least 80% of the weekly seminars, and fill out evaluation forms. Each student seminar must be supervised by a faculty member (not necessarily the student's advisor). The faculty member will work with students to ensure that the seminars are both appropriate and interesting for the audience.

### **BMI 7170 Project Advisement**

1 semester credit hour

Prerequisite: Consent of instructor

Required for doctoral students; must be repeated for up to 3 hours to meet the degree requirement

Required for DHI students

DHI students will use this course to develop a proposal/plan to be used as a basis for their translational practice project. Students must complete three semester credit hours with the supervision of their primary advisor and additional committee members. The proposal/plan will be used to prepare for the project execution as students develop a timeline for completion of the translational practice project during this course.

### **BMI 7301 Grant Writing**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Classroom instruction

Required for PhD students



Students will develop skills in the planning and execution of grant development. The focus will be on NIH and NSF grants forms, but students will also be exposed to grant applications from private organizations. The goal of the course is to enable students to develop a draft that can be used for the funding of dissertation work or to develop a grant that would allow students to continue their dissertation work in a post-dissertation award. Students will learn how to write the narrative, project time lines, include appropriate evaluation and draft budgets.

**BMI 7302 Theories and Frameworks for Biomedical Informatics Research**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Classroom instruction

Prerequisites: BMI 5300, BMI 5310, and BMI 5311

Required for PhD students

This course introduces a variety of significant theories, frameworks and models that are relevant to biomedical informatics knowledge and research. Students will explore these through exploration of methods and application papers. By the end of the semester students will be able to identify theories, frameworks and models that are applicable to their doctoral research.

**BMI 7303 Critical Review of Biomedical Informatics Literature Seminar**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Classroom instruction

Prerequisites: BMI 5300, BMI 5352, BMI 5310, and BMI 5311

Required for PhD students

The purpose of the critical literature review seminar is to apply and deepen knowledge from an area of biomedical informatics study and demonstrate proficiency in reviewing, synthesizing, and critically analyzing the research literature in a topic area that relates directly to the student's chosen dissertation topic. By the end of the semester each student will have completed a draft literature review of their chosen subject.

**BMI 7304 Advanced Research Design for Biomedical Informatics**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Classroom instruction

Prerequisites: BMI 5300, BMI 5352, BMI 5310, and BMI 5311

Required for PhD students

This course will provide an in-depth examination of advanced research design and methods for establishing causal statements about the efficacy, effectiveness and generalizability of biomedical informatics research to improve human health. Standards for stating/claiming that an intervention is evidence-based will also be addressed. By the end of the semester, students will be able to provide a plausible research design given a scenario and hypothesis.

**BMI 7320 Topics for Artificial Intelligence in Cancer Discovery**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based instruction and classroom instruction

Prerequisite: Consent of instructor

Enrollment only open to PhD Students

This course introduces a few common deep learning architectures (e.g., convolution neural network, graph neural network, recurrent neural network and autoencoder) to students who are new to AI. The primary aim of this course is to flatten the learning curve in AI and to provide students with a basis for further implementation of more complex models using enormous real-world data, especially in cancer research.

**BMI 7350 Scholarly Foundations of Advanced Health Informatics Practice**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based instruction

Prerequisite: BMI 5300

Required for DHI students

This foundational course focuses on analyzing health informatics competencies, role, and scholarship as the foundation for scholarly practice at the doctoral level. The foundations of science and scientific inquiry are explored including the epistemological and ontological bases for scientific methods, theory, and knowledge. Sources of evidence, theory, and knowledge for health informatics practice are analyzed. Evidence based practice, leadership, innovation/change, inter-professional collaboration/teams, and quality and safety, are introduced as fundamental components of health informatics practice. Implementation science is investigated as a means of guiding science-based practice.

**BMI 7351 Evidence-Based Health Informatics Practice**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based instruction

Prerequisite: BMI 5300

Required for DHI students

In this course the doctoral student will learn the importance of evidence for the advancement of Informatics practice, improvement of varied outcomes, and advancement of the information technology to support a learning health system. The student will apply skills to focus on the current urgency of evidence application to practice, and have a hands-on illustration of how to appraise, summarize and translate evidence to support recommendations for quality improvement and sustainment in a learning health system. In addition, this course is intended to update and enhance evidence-based practice knowledge and process for conducting a search, critiquing, and evaluating research publications. Students

will learn to perform an electronic literature search from electronic databases and assess, investigate and recommend informatics practice using an evidence-based practice methodology.

**BMI 7360 Advanced Project Management**

3 semester credit hours

Lecture contact hours: 2; Lab contact hours: 3

Web-based instruction

Prerequisite: BMI 5328 or Consent of instructor

Required for DHI students

Lab Fee: \$30

Course Fee: \$50

This course is an advanced project management for doctoral students. The student will develop a management plan for a health care information technology project identifying a specific set of operations designed to accomplish a singular goal, to deliver on-time, on-budget, evaluating performance and project integration supporting the strategic goals of the organizations. Moreover, the student will learn to apply evidence-based practice and project management methods and core activities of a project manager that incorporate the five project management processes as well as the tools and techniques essential to the ten project management knowledge areas as defined by the Project Management Institute, Inc.

**BMI 7361 Business, Contract and Vendor Management**

3 semester credit hours/meets part of DHI core competencies

Lecture contact hours: 2; Lab contact hours: 3

Web-based instruction

Prerequisite: BMI 5300

Required for DHI students

In this course the doctoral student will learn the skills needed to effectively manage vendors, as well as negotiate and manage contracts. Through hands-on exercises, students will learn the role of governance to oversee contractual, financial, and service delivery performance that can improve outcomes within projects, programs, and the overall organization portfolio. This governance can be built into the relationship from the onset of the engagement to improve the overall health of the relationship and maximize value for current and future engagements. Students will develop an integrated understanding of how vendors are chosen, motivated and managed, as well as strong contract negotiation skills.

**BMI 9950 Project Evaluation and Writing**

1-9 semester credit hours (variable hours)

Required for DHI students; may be repeated for up to 9 hours to meet the degree requirement

Prerequisite: Consent of instructor

Doctoral students will use this course to develop a project evaluation report to be written upon completion of the translational practice project. Students must present the translational project findings at an oral session that is open to the public. This course may be repeated for at least 9 semester credit hours to meet the degree requirement.

**BMI 9999 Dissertation in Biomedical Informatics**

1-9 semester credit hours (variable hours)

Required for PhD students; may be repeated for 9 hours to meet the degree requirement

Prerequisite: Consent of Instructor

The post-candidacy doctoral student will use this course to write their doctoral dissertation under the supervision of their primary mentor, and in collaboration with their advisory committee. This course may be repeated for at least 9 hours to meet the degree requirement.