Perelman School of Medicine
University of Pennsylvania

Institute for Biomedical Informatics

# Biomedical Informatics Masters and Certificate Programs

## Student Handbook

2025-2026

# PROGRAM CONTACTS

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# Contents

# MASTER OF CLINICAL INFORMATICS PROGRAM

## Introduction

The Master of Clinical Informatics (MCI) program serves the needs of Penn Medicine by training the next generation of clinical informaticians. These are individuals who seek to leverage their background and practice as professional clinicians to bring state-of-the-art informatics theory and practice to the clinical setting. As a result, the program is dedicated to training applied clinical informaticians, rather than informatics researchers.

### Program Learning Objectives

Our program's objectives are drawn from the key competencies identified by the American Medical Informatics Association's 2017 guidelines, which identify the skills and knowledge that informatics practitioners need to set themselves apart in a rapidly developing field. By graduation, students should be able to:

1. Identify the applicable information science and technology concepts, methods, and tools, which may be dependent upon the application area of the training program, to solve health informatics problems.
2. Identify and draw on the social, behavioral, legal, psychological, management, cognitive, and economic theories, methods, and models applicable to health informatics to design, implement, and evaluate health informatics solutions.
3. Identify possible biomedical and health information science and technology methods and tools for solving a specific biomedical and health information problem. Design a solution to a biomedical or health information problem by applying computational and systems thinking, information science, and technology.
4. Define and discuss the scope of practice and roles of different health professionals and stakeholders, including patients, as well as the principles of team science and team dynamics to solve complex health and health information problems.

## Academic Program

### *MCI Curriculum*

The MCI curriculum consists of 10 course units (CUs), which include required courses, electives, and a capstone project. Students are also required to complete the online HIPAA and CITI training modules required of all PSOM students.

The 10 CUs in the MCI program are divided as follows:

**A. 4.0 CUs in "Core BMI" (common courses across IBI programs):**

- **BMIN 5010: Introduction to Biomedical and Health Informatics (Fall)** This course is designed to provide a survey of the major topic areas in medical informatics, especially as they apply to clinical research. Through a series of lectures and demonstrations, students will learn about topics such as medical data standards, electronic health record systems, natural language processing, clinical research informatics, clinical decision support, imaging informatics, public health informatics, consumer health informatics, perioperative informatics, and mental health informatics.
- **BMIN 5020: Database and Data Integration in Biomedical Research (Spring)** This course is intended to provide in-depth, practical exposure to the design, implementation, and use of databases in biomedical research, and to provide students with the skills needed to design and

conduct a research project using primary and secondary data. Topics to be covered include: database architectures, data normalization, database implementation, client-server databases, concurrency, validation, Structured-Query Language (SQL) programming, reporting, maintenance, and security. All examples will use problems or data from biomedical domains. MySQL will be used as the database platform for the course, although the principles apply generally to biomedical research and other relational databases.

- **BMIN 5030: Data Science for Biomedical Informatics (Fall)** This course will use RStudio/R and other freely available software to learn fundamental data science applied to a range of biomedical informatics topics, including those making use of health and genomic data. After completing this course, students will be able to retrieve and clean data, perform exploratory analyses, build and evaluate models to answer scientific questions, and present visually appealing results to accompany data analyses; be familiar with various biomedical data types and resources related to them; and know how to create reproducible and easily shareable results with RStudio/R and GitHub.
- **BMIN 5040: Special Topics in Biomedical and Health Informatics (Spring)** This course is designed to provide an in-depth look at topics that are of essential importance in biomedical informatics. Each topic will be arranged into thematic modules which will occur in consecutive weeks in the class schedule, with the intention that each module becomes its own "mini-course". The topics for each module may rotate from semester to semester, based on these criteria: Historical importance to the current field of biomedical informatics research and/or practice; Cutting-edge developments in biomedical informatics; Topics not covered in depth in BMIN 501; Consensus of the program leadership and teaching faculty.

**B. 3.0 CUs in "Core Clinical Informatics":**

- **BMIN 5060: Standards and Clinical Terminologies (Spring, 1.0 CU)** This survey course is designed to provide an overview of health information standards and clinical terminologies. Through a series of lectures, demonstrations, and hands-on exercises, students will learn about topics such as standards, interoperability, data modeling, vocabularies, and health information exchange.
- **BMIN 5070: Human Factors (Fall, 1.0 CU)** The course covers seven main topic areas that will employ case studies from health system applications as well as models, techniques, and theory.

  The first half (taught by Ross Koppel, PhD) addresses:
  1. Sociotechnical and human-centered design everyday life and in biomedical informatics; 2. Evaluation and measurement of usability; 3. Implementation and optimization—including tensions among existing vs revised workflows, new software vs legacy systems, vendor software vs need for new builds, customization, retrofits, dongles, etc; 4. Ethics, policy, cybersecurity, and advocacy.

  The second half (taught by Susan Harkness Regli, PhD) addresses healthcare-based applications of human factors that specifically include technology:
  1. Human Computer Interaction history and key concepts; 2. Complex applications and multiple methods for design in applications such as electronic health records, clinical decision support

(CDS), and patient safety; 3. Artificial Intelligence in healthcare including of Natural Language Processing (NLP) and Large Language Models (LLMs) as tools for documentation and reducing clinician burnout.

Each topic area will incorporate principles, methods, and applications. In the principles section for each topic, the course will seek to clearly and define terminology related to the topic area, review how key concepts relate to each other, and examine the relevance of the topic's role to applied clinical informatics. The course will cover qualitative, quantitative, and computational methods used for the design, implementation, and evaluation of health information technology, especially Electronic Health Records (EHRs). The applications section for each topic will use relevant case studies that examine the real-world application of principles and methods.

- **BMIN 5110: Biomedical Informatics Methods for Learning Health Systems (Fall, 1.0 CU)**
  This course provides an introduction to the concepts and principles of learning health systems, focusing on the roles and methods of biomedical informatics in the data-knowledge-practice learning cycle that is the hallmark of such systems. Topics to be included in the course are history of health systems; information systems analysis and design as these apply to learning health systems; methods for integrating data from heterogeneous sources; analytic methods for establishing evidence and evaluating its usefulness in improving patient outcomes; and, working with teams in the learning health system context. There is a strong emphasis on applying these techniques to real-world issues with clinical and clinical research information systems. These include the electronic health record, information systems in clinical specialties, and systems to support the management of data used for clinical research and healthcare administration.

**C. 2.0 CUs of electives (further expertise in clinical informatics methods or issues)**

Possible electives include, but are not limited to:

- Implementation Science (HPR 6200)
- Systems Thinking in Patient Safety (HPR 6500)
- Longitudinal and Clustered Data (EPID 6210)
- Decision Models and Uncertainty (OIDD 6210)
- Data visualization and interaction design (CIS 5600)
- Data ethics, IP, and privacy (LAW 5060)
- Data mining (ESE 5450)
- Medical Devices (HCMG 8530)
- Comparative Health Care Systems (HCMG 8590)
- Introduction to Bioinformatics (GCB 5350)
- Decision Support Systems (OPIM 6720)
- E-Health: Business Models and Impact (HCMG 8660)
- Process Improvement Tools and Strategies (DYNM 6340)
- Qualitative Methods Research (HPR 5030)
- Clinical Economics and Decision Making (HPR 5500)
- Principles and Practice of Quality Improvement and Patient Safety (HPR 5040)

- Impact Evaluation (PUBH 540)
- Health Communication in the Digital Age (PUBH 5650)
- Organizational Project Management (DYNM 6190)
- Introduction to Machine Learning (CIS 5190)
- Big Data Analytics (CIS 5450)

**D. 1.0 CU Capstone Project (formal, mentored practicum)**

- BMIN 9900: Capstone

## *Capstone Projects*

*General description*

The MCI program requires that students engage in a mentored Capstone Project in clinical informatics during their final year. This is accomplished in the context of a seminar in which students develop, propose, implement, and present their capstone project. During the semester, students meet regularly with their Capstone Advisor, who is also invited to attend the seminars. The seminar affords both students and advisors the opportunity for cross-fertilization of ideas and skills, and ultimately the honing of projects to a high level of value for the students and the clinical environments in which they conduct their projects.

*Required Prerequisite: Minimum of 7 CUs of the required coursework of the MBMI Program*

*Capstone Advisors*

Each project is supervised by an IBI Senior Fellow, selected by the student and vetted by the Advising Committee. The Capstone Advisor will be selected by the student for expertise in the topic addressed in the capstone. Additional individuals with expertise relating to the student's project can join the advisory team as needed. The Capstone Advisor will be responsible for ensuring a high degree of quality of the project and the student's work thereupon. The Capstone Advisor will be responsible for guiding and evaluating the student's progress throughout the semester, and for submitting the final evaluation and a grade. This grade is then used as part of the overall capstone grade (see Deliverables below).

*Capstone projects*

Capstone projects may align with the day-to-day responsibilities of the student's employment or may be in a new area of interest. Projects should be completed in the course of a 15-week semester. However, the proposal and determination of Capstone Mentor takes place in the semester prior to the capstone project semester. For example, if a student intends to perform their capstone project in the spring semester then the proposal and mentorship team deliverables are due in the fall semester. Sample projects could include:

1. Design, implementation, and evaluation of a clinical decision rule
2. A workflow analysis pertinent to a given clinical environment
3. Evaluation of a feature or set of features of an existing clinical information system
4. Development and evaluation of a training program for new users of a clinical information system
5. Assessment of clinical information system adoption by health professionals
6. Design, implementation, and evaluation of a novel feature in a patent portal system
7. Development and evaluation of a program for improving patient engagement in using patient portals
8. Design and evaluate a clinical process improvement

DeliverablesThe capstone will culminate in the preparation of a written final report and a PowerPoint capstone project presentation.
The written final capstone report paper will consist of the following:

- thorough critical review of pertinent literature
- statement of the problem or research question
- clearly articulated statement of the goal(s) of the project
- description of the aims proposed to addressed the goal(s)
- methods used to address the aims
- results
- discussion of the results
- conclusion
- description of future directions

Two IBI Senior Fellows will serve as Discussants and will evaluate both the written final capstone report paper and the capstone project presentation, and provide oral and written feedback to the student and Capstone Advisor (s).

The components of the student's final capstone grade (for the semester) are as follows:

- Capstone Final Capstone Report Paper - 50%
- Capstone Advisor Grade - 35%
- Capstone Final Capstone Project Presentation - 15%

### *Elective coursework eligibility*

Elective courses must be approved by the Curriculum Committee prior to enrollment, and following completion of the MCI Elective Approval Form, which is available from the Program Coordinator. Students will be required to provide a justification for the requested elective coursework, including a description of how the course(s) accomplish their future career and/or research goals.

In situations where similar elective courses are offered within the BMIN program and in other departments/programs, students will be expected to enroll in the BMIN course. For example, courses focusing on Artificial Intelligence are offered in several different schools and departments at Penn. Since the courses external to BMIN do not focus on applications of AI in health, those courses are less appropriate for MCI students, and therefore the student should enroll in the BMIN equivalent. Exceptions to this guideline may be granted if the BMIN equivalent is not compatible with the student’s schedule or if the external course covers subject matter that is particularly important to the student’s future career or research goals – these situations should be clearly documented in the MCI Elective Approval Form upon submission.

# MASTER OF SCIENCE IN BIOMEDICAL INFORMATICS PROGRAM

## Introduction

The Master of Science in Biomedical Informatics (MSBMI) program provides comprehensive, research-driven training designed to prepare students for impactful careers as innovators and investigators in biomedical informatics. With a strong focus on advanced research methodologies, the MSBMI curriculum culminates in a mentored research project and thesis defense. This rigorous training ensures graduates are well-equipped to advance knowledge and lead developments within the rapidly evolving field of biomedical informatics.

## Academic Program

MSBMI Curriculum

The MSMBI Curriculum consists of 12-credit curriculum. MSBMI and MCI students would share a core of 4 courses (BMIN 5010, 5020, 5030, and 5110), Two additional core courses are designed for MSBMI students; *BMIN 5130: Quantitative Research Methods* and *BMIN 6010: Seminar in Advanced Topics in Biomedical Informatics*. Students will take 3 concentration-specific courses and one elective and will be awarded 2 thesis credits upon successful defense of their thesis.

All MSBMI students must complete the online HIPAA and CITI training modules required of all PSOM students.

Program Concentrations

Students in the MSBMI will declare in one of three available concentrations: Clinical Science Informatics (CSI), Translational Bioinformatics (TBI), and Health Artificial Intelligence (HAI). The three concentrations differ in their course curriculum and in the domain focus of the master's Thesis. Students will seek a thesis mentor with primary expertise in the declared concentration.

Thesis

The thesis is the central research requirement for the degree. Planning for the thesis will begin early in the first semester of study. Students are required to engage in a research project of their own design under the supervision of their primary mentor. The primary mentor will help the student identify a feasible research question for the thesis. The thesis should consolidate students' knowledge of the principles and practice of biomedical informatics research. The thesis topic will be in the area of curricular concentration and address the CAHIIM competencies.

Trainees are required to complete a thesis that involves designing a research project, writing a formal research proposal, performing the study described in it, analyzing the data collected, summarizing the results in a publishable manuscript(s), and presenting and defending the thesis at a public seminar.

The thesis provides hands-on experience in formulating one or more research questions; searching the medical literature; translating research question(s) into an appropriate research design; assessing study feasibility; writing a detailed study protocol; designing data collection instruments; conducting the research, performing data

analysis; and preparing a manuscript for publication.

The thesis is required to be in the form of a publishable manuscript for submission to an indexed, peer-reviewed journal. There will be opportunities for students to present their work at the annual Informatics Day event, conducted by the PSOM Institute for Biomedical Informatics (IBI), as well as at national meetings, contingent on funding.

Mentorship and Student Advising

Each student will have three supervising mentors, working as a team with the student: a primary research mentor, an application domain mentor, and a research methods mentor. The primary mentor will be a faculty member with expertise in informatics, typically a Senior Fellow of the Institute for Biomedical Informatics (IBI). Currently, IBI has more than 90 Senior Fellows from across the University of Pennsylvania. The application mentor may be an informatician, but more often a faculty member in one of the Penn health schools who has expertise in a particular clinical or biomedical problem. The methods mentor may be an informatician, but could also be faculty in statistics/biostatistics, computer science, implementation science, or other programs or departments.

## Transfer Policy: MCI to MSBMI

Students currently enrolled in the Master of Clinical Informatics (MCI) program who wish to transfer to the Master of Science in Biomedical Informatics (MSBMI) program must submit an official request to the Admissions Committee. As part of the transfer request, students are required to provide an updated transcript reflecting their academic performance in the MCI program.

The Admissions Committee will review each request holistically to determine eligibility for the MSBMI program. Approval will be based on academic standing, alignment of research interests with the MSBMI curriculum, and overall fit for the program's research-oriented training focus.

## CERTIFICATE IN BIOMEDICAL INFORMATICS PROGRAM

The Certificate in Biomedical Informatics is for students seeking training in biomedical informatics but not at a degree level. It consists of the same four CUs in "Core BMI" courses required of all Masters-level students. The four-course sequence is designed to foster informatics literacy among the Penn community.

All certificate students must complete the online HIPAA and CITI training modules required of all PSOM students.

At present, only Penn and CHOP affiliates are eligible to apply to the certificate program. Our target students are clinical professionals or biomedical researchers working in a clinical-adjacent field who are looking for basic training in biomedical informatics.

The certificate program follows the same policies as the MCI program, except where otherwise specified.

## TIME TO DEGREE

The masters and certificate programs are designed primarily for part-time students but may be completed in as few as three semesters (18 months) for the MCI program, four semesters (24 months) for the MSBMI program or two semesters (8 months) for the BMI Certificate program. Government policies dictate that the total time to degree may not exceed 150% of the student's academic plan at the time of matriculation.

We expect most students to complete the program over the course of two to three years, but some students may complete the program in three semesters. Students may request an alternative plan of study to extend their planned time to degree. All students must complete the degree in four years. Failure to complete degree requirements will result in the student being dismissed from the program.

Some possible course plans are given below.

*MCI and BMI Certificate Programs:*

Full time:

| | Fall | Spring | Summer |
|---|---|---|---|
| Year 1 | BMIN 5010: Intro to BMI | BMIN 5020: Databases | Capstone Project |
| | BMIN 5030: Data Science | BMIN 5040: Special Topics in BMI | |
| | | BMIN 5110: Learning Health Systems | |
| | BMIN 5070: Human Factors | BMIN 5060: Standards and Vocabularies | |
| | Elective | Elective | |

Part time:

| | Fall | Spring |
|---|---|---|
| Year 1 | BMIN 5010: Intro to BMI | BMIN 5020: Databases |
| | BMIN 5030: Data Science | BMIN 5110: Learning Health Systems |
| | | BMIN 5060: Standards and Vocabularies |
| Year 2 | Elective | BMIN 5040: Special Topics in BMI |
| | BMIN 5070: Human Factors | Capstone Project |
| | Elective | |

*MSBMI Program:*

Clinical Sciences Informatics concentration full-time program (two years to completion):

| Year | Semester | Course | Course units |
|---|---|---|---|
| 1 | Fall | Introduction to Biomedical Informatics (BMIN 5010) | 1 |
| | | Data Science (BMIN 5030) | 1 |
| | | Quantitative Research Methods (BMIN 5130) | 1 |
| | Spring | Database and Data Integration in Biomedical Research (BMIN 5020) | 1 |
| | | Informatics Research Methods for Learning Health Systems (BMIN 5110) | 1 |
| | | Standards and Vocabularies (BMIN 5060) | 1 |
| 2 | Fall | Human-Computer Interaction (BMIN 5070) | 1 |
| | | Foundations of Artificial Intelligence (BMIN 5020) | 1 |
| | | Thesis | 1 |
| | Spring | Advanced Special Topics in Biomedical Informatics (BMIN 6010) | 1 |
| | | Elective | 1 |
| | | Thesis | 1 |
| **Total course units required for the MSBMI degree** | | | **12** |

Clinical Sciences Informatics concentration part-time program (three years to completion):

| Year | Semester | Course | Course units |
|---|---|---|---|
| 1 | Fall | Introduction to Biomedical Informatics (BMIN 5010) | 1 |
| | | Data Science (BMIN 5030) | 1 |
| | Spring | Database and Data Integration in Biomedical Research (BMIN 5020) | 1 |
| | | Informatics Research Methods for Learning Health Systems (BMIN 5110) | 1 |
| 2 | Fall | Quantitative Research Methods (BMIN 5130) | 1 |
| | | Standards and Vocabularies (BMIN 5060) | 1 |
| | Spring | Human-Computer Interaction (BMIN 5070) | 1 |
| | | Elective | 1 |
| 3 | Fall | Foundations of Artificial Intelligence (BMIN 5020) | 1 |
| | | Thesis | 1 |
| | Spring | Advanced Special Topics in Biomedical Informatics (BMIN 6010) | 1 |
| | | Thesis | 1 |
| **Total course units required for the MSBMI degree** | | | **12** |

## PSOM CLINICAL INFORMATICS AREA OF CONCENTRATION PROGRAM

The Clinical Informatics Area of Concentration (AOC) program is designed to train medical students to think like clinician informaticists, capable of leveraging technology and data analytics to improve the way that we deliver health care.

As health systems become increasingly reliant on data and technology, clinical informatics—the application of informatics and information technology to deliver healthcare services—has emerged as an essential subdomain of medical knowledge. As such, we must now train physicians with dual expertise in clinical medicine and informatics who can adapt to, utilize, and improve healthcare information systems.

**Objectives:**

1. Develop an understanding of important topics in clinical informatics, including health IT data structures, clinical decision support, human factors, QI, policy, and care delivery models.
2. Gain an appreciation for the top-to-bottom operations involved in driving a complex health system towards the forefront of health information technology.

3. Gain applied experience in developing and implementing technological solutions to improve the speed, ease, and efficiency of patient care throughout Penn Medicine.
4. Develop practical skills in Epic, project management, or programming.

Please refer to the section on Clinical Informatics MD Program for specific program requirements.

**Faculty Director:** John Holmes, PhD, FACE, FACMI

**Faculty Advisors:** Anthony Luberti, MD, Srinath Adusumalli, MD, MSHP, MBMI, FACC, Peter Gabriel, MD, MSE, Eugene Gitelman, MD

**Coordinator**: Meg Tanjutco

## PSOM AND UNIVERSITY POLICIES

### *Student Conduct*

Students must comply with the University's Code of Student Conduct and other University policies related to student conduct that appears in The PennBook: Resources, Policies and Procedures Handbook. These include, but are not limited to, policies on sexual harassment, acquaintance rape and sexual violence, appropriate use of electronic resources, open expression, and drug and alcohol usage. Students are also expected to abide by the policies adopted by PMCP as well as University Policies relevant to Graduate Education. Further information regarding University policies can be found in the Pennbook at https://catalog.upenn.edu/pennbook/.

Any student who exhibits unprofessional behavior as determined by program leadership will be evaluated for probation. Continued unprofessional behavior will be grounds for removal from the program.

### *Responsible Student Conduct*

Penn recognizes that people are the most important resource for achieving eminence in accomplishing our mission in the areas of teaching, research, community service, and patient care. Penn is an institution that values academic freedom, diversity and respect for one another. Penn is committed to the principle of non-discrimination and does not tolerate conduct that constitutes harassment on any basis, including sexual, racial, ethnic, religious, or gender harassment.

A complete list of 10 principles of responsible conduct are available through the Office of Audit, Compliance and Privacy, accessible here: https://oacp.upenn.edu/oacp-principles/respect-for-others-in-the-workplace/

### *Code of Academic Integrity*

https://catalog.upenn.edu/pennbook/code-of-academic-integrity/

### *Code of Student Conduct*

https://catalog.upenn.edu/pennbook/code-of-student-conduct/

### *University of Pennsylvania Equal Opportunity and Nondiscrimination Statement*
https://catalog.upenn.edu/pennbook/nondiscrimination-statement/

### *Sexual Misconduct Policy, Resource Offices and Complaint Procedures*
https://catalog.upenn.edu/pennbook/sexual-misconduct-resource-offices-complaint-procedures/

### *Student Grievance Procedure*
https://catalog.upenn.edu/pennbook/student-grievance/

### *Financial Policies*
https://catalog.upenn.edu/pennbook/financial-policies/

### *Authorship*
Students are required to adhere to the guidelines as set forth by the University of Pennsylvania Perelman School of Medicine Authorship Policy, including qualifications for authorship, the authors and responsibilities, and disclosure of funding and potential conflicts of interests: https://www.med.upenn.edu/evdresearch/assets/user-content/documents/2_Announcement_MemoLJLRE_PerelmanSchoolofMedicineAuthorshipPolicy.pdf

### *Tuition and Fees*
Tuition is calculated based on course unit plus general and technical fees. Tuition for non-MXX courses vary by department in the summer term and students should contact the individual department to verify tuition cost. For current tuition rates, visit https://srfs.upenn.edu/costs-budgeting/med/masters

Description of Fees

- **General Fee:** A General Fee is assessed to all undergraduate, graduate, and professional students, and directly funds Penn's non-instructional student support services.

- **Technical Fee:** The Technology Fee is used to cover technology-driven services, including library electronic research tools, course portal, and use of email accounts.

- **Clinical Fee:** Full-time students (enrolled in more than 2 CUs in a term) are required either to pay a separate Clinical Fee for access to the Student Health Service or to enroll in a health insurance plan that provides a capitated payment to the Student Health Service (i.e., the Penn Student Insurance Plan or a private plan that provides and equivalent capitated payment).

  A review of the Penn Student Insurance Plan can be found at the following website: https://shs.wellness.upenn.edu/psipinsurance/

### *Supplemental Financial Policies*
All students are billed per course unit (CU) up to 3CU. At 3CU, the General Fee and Technology Fee are billed at a flat rate and will not increase after 3CU. Tuition will not be billed at a flat rate.

At 3CU, a student is considered full-time and is eligible for access to campus recreation spaces. Full-time students will be billed a Clinical Fee each term, which provides access to Student Health Services. Students who are full-time employees—at Penn or elsewhere—and have health insurance through their employer should notify the

program so that the Clinical Fee may be removed; Penn employees do not have access to Student Health Services.

## *Registration*

Registration Process

Students are responsible for registering for courses by submitting a permission request of the courses you plan to take for the upcoming semester using Path@Penn, the online registration system.

Continuous Registration

Continuous registration as a master's or certificate student is required for Fall and Spring terms. Students who do not plan to register during mandatory terms should request a leave of absence.

Leave of Absence

A student who wishes to take a leave of absence should contact the Program Coordinator.

A student may request a leave of absence at any time and may be granted by the program director for up to one year with the possibility of renewal. A leave of absence will be granted for military duty, medical reasons, and for family leave; this leave is typically for up to one year and "stops the clock" on time to completion. Personal leave for other reasons may be granted for up to one year with the approval of the Program Director, but it does not automatically change the time limit.

Upon requesting a leave of absence, a student should complete the form with an estimated date of return. Failing to register for coursework without permission from the University does not constitute a leave of absence. If the student requests leave after the start of the term, all normal drop and withdrawal policies apply.

When returning from a leave, students will contact their program at least thirty days before the start of the term in which they plan to return to confirm they are returning. If a student fails to return from leave within the set time limit or request a renewal, they will be dismissed from the program.

Leave of absence will affect any student loans—either those sought to pay for the degree or those from a previous academic career. This may include loans going into repayment before the end of the leave. Students are encouraged to talk to Student Registration and Financial Services prior to taking a leave of absence to ensure they have planned for shifting financial responsibility.

Registration Timeline

Student registration may be adjusted through Path@Penn through the end of the Course Selection Period for each term, as listed in the term Academic Calendar. After the Course Selection Period ends, registration adjustments must be requested through the program administrators. There will be a financial penalty assessed for dropping a course after the Course Selection Period, following the scheme below:

| | |
|---|---|
| Drop on or before the Course Selection Period ends | 100% reduction of tuition & fees* |
| Drop after the Course Selection Period ends and before the Drop Deadline | 50% reduction of tuition & fees* |
| Drop after the Drop Deadline and before the Withdrawal Deadline | 0% reduction in tuition & fees*<br>Mark of 'W' added to the transcript |
| Drop after the Withdrawal Deadline | 0% reduction in tuition & fees* |

| | |
|---|---|
| | Mark of 'WF' on the transcript, indicating Withdrawal with Failure |

*Tuition & fees refers to Tuition, General Fee, and Technology Fee. Clinical Fee is separate and is only removed when registration is below 3CU. Clinical Fee will be removed through the Drop Deadline but not afterward.

Note to students with Penn Faculty / Staff Tuition Benefits: Tuition benefits are calculated based on the number of registered CU and are adjusted in accordance with registration. Tuition benefits will not cover partial tuition & fees left on the bill as a result of dropping a course after the Course Selection Period ends. The portion of tuition and fees remaining on the bill after courses have been dropped are the student's responsibility.

Billing & Payment

Access & Pay Your Student Bill: https://srfs.upenn.edu/billing-payment/pennpay

- University Billing Schedule: https://srfs.upenn.edu/billing-payment/billing-schedule
- Penn Tuition Benefit: https://www.hr.upenn.edu/PennHR/benefits-pay/tuition/tuition-benefits-for-faculty-and-staff
- Third Party Payment: https://srfs.upenn.edu/billing-payment/third-party-payment

## *Grading*

The grading system is as follows: A, excellent; B, good; C, fair; D, poor; and F, failure. The grade of C, while passing, does not constitute satisfactory performance. Letter grades may be modified by a plus (+) or minus (-) sign at the discretion of the course director. The minimum standard for satisfactory work in each course is a B-, and students must maintain a cumulative GPA of 3.0 to remain in good standing. A grade of C+ or lower must be remediated, pursuant to the policy on Grade Remediation. The MBMI and BMI Certificate programs additionally require that the quality of the students work and their conduct in the program is of an appropriate professional quality to ensure advancement. Failure to meet these requirements may result in a student being placed on probation and/or require a student to withdraw despite a satisfactory grade average.

The grading system converts letter grades to a GPA on the 4.0 scale:

| | |
|---|---|
| A+ | 4.0 |
| A | 4.0 |
| A- | 3.7 |
| B+ | 3.3 |
| B | 3.0 |
| B- | 2.7 |
| C+ | 2.3 |
| C | 2.0 |
| C- | 1.7 |
| D+ | 1.3 |
| D | 1.0 |
| D- | 0.7 |
| F | 0.00 |

The grade "I" is used to designate "incomplete." A student who fails to complete a course and does not withdraw or change his/her status to auditor within the prescribed period shall receive at the instructor's discretion either a grade of I (incomplete) or F (failure). It is expected, in general, that a student shall complete the work of a course during the term in which that course is taken. The instructor may permit an extension of time up to one year for

the completion of the course. In such cases, any course which is still incomplete after one calendar year from its official ending must remain as "incomplete" on the student's record and shall not be credited toward a degree.

The notation of GR or NR will appear when grades are delayed and will be amended when the grades are submitted.

### *Audit Policy*

Students who wish to audit a course are expected to designate the audit at the time of registration. It is important to note that students who audit a course must pay tuition, but they will not receive credit towards their degree. If a student wishes to change a course status from credit to audit, they must obtain permission from the course instructor before the "course selection" period ends. The audited course will appear on the transcript with the grade of "AUD" and no credit will be earned toward graduation. Students are not permitted to change the course status from graded to audit after the course has ended.

### *Academic Standing & Probation*

The MBMI and BMI Certificate programs have specific academic standards that are expected of all students. Students are encouraged to communicate and meet regularly with program leadership to discuss academic progress. If a student fails to obtain a passing grade (B-or higher) for a required course, he/she will be placed on academic probation. When placed on Academic Probation, the student may be unable to register for coursework or access transcripts. Students will be notified of their probation status through written communication. The program leadership will work with the student to develop a plan for academic success. Students may take a leave of absence, during which the student may complete remedial or missing coursework. Upon request, students will receive continued access to library and academic resources during their leave. Students may continue to enroll in other courses while on probation with the permission of the Program Director and input from the course director, as needed. The student must make arrangements to retake, or take an approved equivalent of, any course in which they receive a grade lower than a B-. A cumulative GPA lower than 3.0 will also result in academic probation. Arrangements for remediation must be approved by the Program Director with input from the Advising and Curriculum Committee as needed.

Core courses with a C+ or lower must be retaken; electives with a C+ or lower may be retaken or replaced. Retaken and/or replacement courses will result in tuition charges. When a student retakes a course, the second instance of the course will be marked as a Repeat. Both the original instance of the course and the retaken instance of the course will appear on the transcript with their respective grades. The grade and course units from the original course will factor into the GPA. The retaken course will be used to satisfy graduation requirements. When a student replaces an elective course with a new elective, both courses will appear on the transcript, but only the better of the two counts toward GPA and the degree.

Any student who receives an unacceptable grade in a course for the second time will be dismissed and will not be eligible for re-admission. The status of any student who is or has previously been on probation and who receives an unacceptable grade for an additional course will be reviewed by the Advising and Curriculum Committee and the Program Director. The committee is authorized to dismiss the student or allow the student to remain in the program on a probationary status.

Any student who exhibits unprofessional behavior as determined by the programmatic leadership will be evaluated for probation. Continued unprofessional behavior will be grounds for removal from the program.

### *Transfer Credit Policy (MBMI Students Only)*

Transfer credit can be given for coursework completed outside of the degree currently pursued. This coursework may be completed at Penn, in pursuit of another degree, (called internal transfer credit) or at another institution (called external transfer credit). All transfer of credit requests will be considered on a case-by-case basis. Transfer credit may be accepted for electives, only with program approval.

Transfer credit may not be applied to the Capstone Project. Courses taken on a pass/fail basis will not be considered for transfer credit. Only courses in which the student received a grade of "B" (3.0) or higher will be considered for transfer credit. No course may be counted toward degree requirements if it has been used toward the requirements for more than one other degree. A maximum of 2 course units outside of the MBMI program may be transferred.

The usual time a course may be valid for transfer is three years from the completion of the course until the time of matriculation. Requests for transfer credit should be submitted to the Program Director together with a course syllabus for the course under consideration. The director will request a review of the course by the Curriculum Committee for its appropriateness for transfer credit.

Students may request substitution of a core course with a more advanced course in that content area. The process for substitution is the same as that for transfer credit.

To receive transfer credit for a course taken at Penn (internal transfer), the course must be at the graduate level, must be taken for a grade, and must have a grade of B or better. Transfer credit from programs at Penn other than the Veterinary, Dental, and MD Program will factor into the GPA. Students should speak with their academic advisor and program staff to request transfer credit and initiate the process.

To receive transfer credit for a course not taken at Penn (external transfer), the course must be at the graduate level, must be taken as part of a graduate program, must be taken for a grade, and must have a grade of B or better. External transfer credit does not factor into GPA but counts toward the CUs required for degree completion. Students requesting external transfer credit must provide a) a syllabus for the course b) an official copy of their transcript from that institution displaying a grade for the course. The program will evaluate the request and assign the appropriate credit to the course.

Transfer credit should be requested no later than the start of the term in which a student expects to graduate, though sooner is preferred. No more than two course units for the degree may be transfer credit.

### *Graduation*

The Master's degree is conferred by the University Of Pennsylvania Perelman School Of Medicine and is granted in May, August, or December. In order to be considered for conferral of the degree, a student must complete a "graduation application" approximately three months prior to the expected conferral date. Prior to each graduation period, the program office will email details and deadlines to all eligible candidates.

### *Voluntary Withdrawal from Program*

Students may withdraw from their program at any time. Please contact your program for the appropriate form to commence official withdrawal proceedings. Students who are considering withdrawal are strongly encouraged to meet with their Program Director to discuss their situation and options. Students are responsible for dropping all registered courses in the semester they wish to withdraw to effectively stop the billing process (in other words, withdrawal from the program does *not* automatically cancel course registration). Students are responsible for all tuition charges and other financial obligations to the University incurred prior to the effective date of withdrawal.

Once students have withdrawn, they may reapply for admission under the program's application portal. Credit completed prior to readmission will be reviewed as transfer credit under the program's transfer credit policy.

### *Drop from Program*

A student may be dropped from their program for reasons listed below. Like a voluntary withdrawal, students will be responsible for any charges or financial obligations to the University incurred before the effective date of the drop.

1. Time Limit: Students are expected to complete their degree within four years of matriculation. Should a student fail to complete their degree within the time limit, the program may drop the student.
2. Academic Progress: Students are expected to maintain continuous registration, maintain a GPA of at least 3.0, carry incomplete marks for no more than a year, *[achieve passing grades on comprehensive examinations],* and achieve grades of B or better in all coursework. If a student does not meet these criteria, they may be placed on probation—with an opportunity to remediate issues with their progress—or dropped from the program.
3. Academic Integrity: Students are expected to follow the University Code of Academic Integrity. Violations of this code may result in the student being dropped from the program.
4. Student Conduct: Students are expected to follow the University Code of Student Conduct. Violations of this code may result in the student being dropped from the program.

A student dropped from their program will receive a letter stating that they have been dropped along with the reason for their drop.

### *Academic Grievances*

Teaching faculty have the authority to make academic judgments in relation to their students. Therefore, if a graduate student wishes to have an evaluation, exam, or course grade reviewed, they must first discuss the matter with their instructor. Should the student and instructor not find a satisfactory resolution, or should a discussion prove impossible, the student may submit a request in writing to the Program Director.

Should the matter not be resolved with the aid of the Program Director, students may ask that that their request be elevated to the Associate Dean for PSOM Master's and Certificate Programs for further review. The role of the Associate Dean is to ensure that the Program has arranged for a proper review of the matter and that the evaluation was fair and impartial and in accordance with relevant University policies.

## INTERNATIONAL STUDENTS

International Student & Scholar Services (ISSS) provides information and guidance on the regulations and laws required to remain in the U.S. legally. Information on pre-arrival, immigration documents, orientation, enrollment, travel information, employment, transfers and counseling related to adjusting to academia and life in University of Pennsylvania are just a few of the services provided. Please visit the ISSS Website for more information.

## ADMINISTRATIVE REQUIREMENTS

Throughout the program, students will be required to keep track of and follow through on all administrative requirements. Below is a summarized list of the requirements:

1. Graduation application – In order to be considered for conferral of the degree students must complete an

online graduation application approximately two months prior to the expected conferral date. The graduation application initiates an academic audit that, assuming all requirements are met, places the student with the next graduation cohort. The MBMI degree is conferred by the University of Pennsylvania Perelman School of Medicine and is granted in May, August, and December of each year.

2. Course evaluations – students are required to complete an evaluation for every course. Students will receive an email notification and website link to the online evaluation at the end of each term. Grades will not be released until evaluations are complete.

### *Research Regulations Compliance*

Because much of the research conducted by our students involves clinical data, it is essential that all studies comply with various research regulations. These policies are designed to protect patient and human subject privacy.

## PENN SYSTEMS

### *PennCard*

PennCard is the official identification card of the University of Pennsylvania and is required for all students. The PennCard Center is located on the 2nd floor of the Penn Bookstore at 3601 Walnut Street. A valid government issued photo I.D. will be required in order to pick up your new PennCard. The Office can be reached at http://www.upenn.edu/penncard**.**

### *PennKey*

Your PennKey name and password gives you access to PennNet, a Penn e-mail account, and many other essential services managed through the Masters and Certificate Programs. All students are required to have a current, active PennKey and password.

### *Path@Penn*

Path@Penn is your main hub for information about your academic records, financial aid, and student profile. It provides access to the academic and financial information students need to succeed, as well as the tools they will use to register for classes.

The first time you log in to Path@Penn, please verify your Personal Information and your Emergency Contacts. If you need help, visit the Path@Penn web page and access Student Quick Reference Guide.

### *Canvas*

Canvas is the online course site system used for the majority of courses and by the University. Individual pages are set up for each course and can be accessed with PennKey and Password. Log in at https://canvas.upenn.edu. Support: canvas@pobox.upenn.edu

# UNIVERSITY RESOURCES

Graduate Student Center
Many resources are available to students via the Graduate Student Center (http://www.gsc.upenn.edu/) including:
New Student Orientation: https://gsc.upenn.edu/resources/new-students
Wellness at Penn: https://gsc.upenn.edu/resources/wellness
Family Center at Penn: https://familycenter.upenn.edu/

Weingarten Learning Resources Center: https://www.vpul.upenn.edu/lrc/

Counseling and Psychological Services (CAPS): https://caps.wellness.upenn.edu/

# ADMINISTRATIVE STRUCTURE

**The Master of Biomedical Informatics and Biomedical Informatics Certificate Programs** fall under the academic umbrella of the Perelman School of Medicine (PSOM) Penn Medicine Masters and Certificate Programs office (PMCP) (http://www.med.upenn.edu/masters.shtml) within the Office of the Vice Dean for Research and Research Training. The administrative home for the MBMI and BMI Certificate programs is the Institute for Biomedical Informatics (IBI).

**The Program Director** is responsible for administrative oversight and academic leadership of the program. The Director also serves as a primary academic advisor to students and is the chairperson of the Admissions Committees. The current Program Director is John H. Holmes, PhD.

**The Executive Committee**
The Executive Committee comprises the Director and Associate Director for Medical Informatics of the Institute for Biomedical Informatics, as well as additional informatics-related faculty from the Perelman School of Medicine and the School of Nursing. The committee oversees the functioning of the MBMI and BMI Certificate programs, including an annual review of the programs, the Student and Faculty Handbooks, ratifying the selection of the Chairs and members of the Steering, Admissions, and the Advising and Curriculum Committees. The Executive Committee also adjudicates any formal written student appeals related to coursework. The Executive Committee may identify and recommend approaches for integration of the MBMI program with others on campus, approval of major changes in policy, and degree requirements.

**The Admissions Committee**
The Admissions Committee will evaluate prospective students and is responsible for all admissions decisions. Members of the committee are selected to represent a broad range of expertise relevant to clinical informatics and curriculum. The Admissions Committee reviews applications from prospective students, selects the most promising applicants for interviews and recruitment, and subsequently, with final approval from Program Director, identify those who will be offered admission. The Admissions Committee is responsible for organizing and implementing recruitment processes, as appropriate.

**The Advising and Curriculum Committee**
The Advising and Curriculum Committee has a twofold responsibility. First, it is charged with helping students select courses, capstone advisors, and approving capstone project proposals.

The committee is also the first level of support for students experiencing difficulties with the program. Issues that

the committee is not able to resolve with the student are escalated to the Executive Committee. The Advising and Curriculum committee meets at least once each semester to review student progress, provide advice on course availability and selection and suggest improved programs to ensure student success.

Second, the Advising and Curriculum Committee is charged with overseeing and providing guidance for the development and maintenance of the curriculum. In this role, the committee considers major or minor revisions to the curriculum, and reviews course evaluations and suggests approaches for remediation as needed. Changes to the curriculum will be approved by the Advising and Curriculum Committee, and then presented to the Executive Committee for approval, which will in turn provide a report to the Steering Committee before any curriculum changes are implemented. Members of the committee are selected to represent a broad range of expertise relevant to clinical informatics and the curriculum.