

The University Senate of Michigan Technological University  
Proposal 32-23

## Establishment of a Graduate Certificate in Foundations of Health Informatics

### Basic Program Information

**Primary Contact:** Dr. Guy Hembroff, Department of Applied Computing Associate Professor and Graduate Director, MS in Health Informatics ([hembroff@mtu.edu](mailto:hembroff@mtu.edu))

**Program/Degree type:** Graduate Certificate

**Program Title:** Foundations of Health Informatics

**Planned Implementation Date:** Fall '23

**Program location/modality:** on-campus and 100% online options.

**Target student population:** Graduate students within the MS in Health Informatics Program, students from health sciences, such as Biological Sciences and KIP, and students from computing, such as Data Science, Cybersecurity, and Computer Science.

### General description and characteristics of program

The Health Informatics program at Michigan Tech proposes a 12-credit certificate named Foundations of Health Informatics. The graduate certificate has the following three objectives:

1. to attract students from various disciplines who wish to learn the basics of health informatics, security and privacy, programming, and clinical data analysis;
2. to teach students basic skills in communication and computing tools;
3. to provide students the opportunity to gain fundamental skills to analyze large clinical data sets.

### Rationale

The proposed graduate certificate will provide academic training in fundamental health informatics topic areas, such as security and privacy, data analysis, programming, and system analysis in the field of healthcare and medicine to students from a wide range of backgrounds (e.g., medical/clinical, management information systems, kinesiology integrated physiology, bio/chem-informatics, computer science, cybersecurity, and biomedical engineering).

Professionals in the workforce, particularly in the medical/clinical and information technology fields, are seeking to equip themselves with foundational health informatics skills in the growing medical/healthcare data-driven sector. The certificate can serve professionals in the field with a path to upskilling and gaining new knowledge in the field of health informatics, where this certificate and its online flexibility, could bridge students wishing to continue to the MS in Health Informatics program after receiving the Foundations of Health Informatics certificate. The 12-credit certificate will also provide a strong foundation in critical health informatics skills for internal Michigan Tech students to provide additional career opportunities and can be obtained in students' first year in the MS in Health Informatics program.

## Related programs: within MTU and at other institutions

There has been a proliferation of Health Informatics programs in the last five years. Here is a sampling of graduate certificate programs:

- [University of Michigan](#), Ann Arbor, MI. The program requires 16-credit hours of instruction and focuses on foundation methods, evaluation methods for health informatics, and sociotechnical components of health information technology (HIT) systems.
- [Boston University](#), Boston, MA. The 16-credit Health Informatics Certificate's objective is to expose students to modern health IT, including health data collection, processing, and storage. This program primarily focuses on electronic medical data generated and stored in health care and public health organizations
- [Grand Valley State University](#), Allendale, MI. This 9-credit graduate interprofessional certificate is designed to prepare individuals interested in gaining comprehensive knowledge and skills in the design, utilization, evaluation, and clinical process of health informatics.
- [Temple University](#), Philadelphia, PA. Offers a 12-credit, online certificate that teaches students the practical skills they need to advance on their current career in healthcare or enter the rapidly expanding field of health informatics. Focuses on evaluation of HIT, data standards/vocabularies, security and privacy requirements, and the impact of IT on healthcare business practices.
- [University of Denver](#), Denver, CO. This 16-credit Health Data Informatics and Analytics Certificate focuses on healthcare data and delivery, ethics and biostatistics, healthcare methods and programming, healthcare data mining, integration, and interpretation.
- [University of South Florida](#), Tampa, FL. This 12-credit Health Informatics Certificate focuses on the introduction to health informatics, management of information systems, health data management, and integrated EMRs.

- [University of Pittsburgh](#), Pittsburg, PA. The 12-credit Health Data Analytics Certificate focuses on practical statistics & programming using Python and R, database design and big data.

## Projected Enrollment

We anticipate online professionals looking to advance or enter the public health field and on-campus graduate students may enroll in the certificate beyond the program’s enrolled MS in Health Informatics students. Given the current level of interest, we expect tlf interest exceeds this projected enrollment, the Resources Needed section provides information on acquisition of additional resources. Table 1 provides 5-year enrollment projections.

Table 1: Foundations of Health Informatics 5-year Enrollment Projections

Semester	On-campus Enrollment	Online Enrollment
Fall 2023	15 students	5 students
Fall 2024	15 students	10 students
Fall 2025	20 students	15 students
Fall 2026	20 students	15 students
Fall 2027	20 students	20 students

## Specialized Accreditation Requirements

There are no specialization accreditation requirements.

## Professional Licensure Requirements

There are no professional licensure requirements.

## Curriculum Details

### Learning Goals

The graduate learning objectives (GLOs) of the Certificate are:

1. Upon completing this certificate, students will be able to prepare, code, and process data for security and privacy, data analysis, and system analysis.
2. Upon completing this certificate, students will be able to take the data and apply appropriate methods and evaluate the results.

### Assessment Plan

Table 2 illustrates Assessment Points mapping to respective GLOs and its annual assessment.

Table 2: GLOs for the Foundations of Health Informatics Graduate Certificate

Assessment Points	Graduate Learning Objectives (GLOs)
Data Preparation and Analysis Evaluation	GLO1
Application of Methods and Evaluation of Results	GLO2

## Curriculum Design

Table 3 illustrates the curriculum design of the required **12 credits** needed for the Foundations of Informatics Certificate.

Table 3: Foundations of Health Informatics Certificate Curriculum Design

Course	Name	Credits	Prerequisites	Required or Elective	Semester Offered	On-campus Offering	Online Offering
SAT 5001	Intro. to Health Informatics	3 credits	Graduate Student	Required	Fall	Yes	Yes
SAT 5111	Security and Privacy	3 credits	Graduate Student	Required	Fall	Yes	Yes
SAT 5131	Systems Analysis and Design	3 credits	Graduate Student	Required	Spring	Yes	Yes
SAT 4650	Applied Computing in Python Programming	3 credits	none	Elective	Fall/Spring	Yes	Yes
UN 5550	Intro. to Data Science	3 credits	Graduate Student	Elective	Fall/Spring	Yes	No

## New Course Descriptions

Below lists the description for each required and elective course for the required 12-credits Foundations of Health Informatics Graduate Certificate. Each course already exists in its respective department.

### SAT 4650 – Applied Computing in Python Programming

This course introduces students to the Python programming language in applied computing systems and applications. In addition to Python basics, introduction to advanced topics such as file operations, database connection, digital image processing, and artificial intelligence will be discussed, particularly within the field of health informatics.

### UN 5550 – Introduction to Data Science

Introduces concepts and skills fundamental to Data Science including obtaining data, data wrangling, exploratory data analysis, basic statistics, data visualization, data modeling, and learning. The course introduces data science from different perspectives: computer science, mathematics, business, engineering, and more.

### SAT 5001 – Introduction to Health Informatics

The course focuses on fundamental subjects, such as medical decision support systems, telemedicine, medical ethics, and biostatistics. Topics include consumer health informatics, international health care systems, global health informatics, translational research informatics and homecare. Students will see health informatics from diverse perspectives. Scientific writing and communication will be encouraged.

### SAT 5111 – Security and Privacy

Examines key health information security, policy, and procedures. Investigates how to distinguish elements of a security audit and key security policies. Analyzes the roles of those tasked with maintaining health information security and explains elements of these roles within the organization. Introduces students to security and privacy-focused Python and Web application coding used in healthcare IT security.

### SAT 5131 – System Analysis and Design

Provides knowledge of tools available to perform systems analysis, examines key factors in systems design, emphasizes importance of communication, and an understanding of the primary factors in systems implementation. Course will examine strategies, risks, and key factors in purchasing systems.

## Model Schedule

Table 4 illustrates the certificate’s capability to be completed in a two-semester sequence or spread over three semesters (depending on student preference and scheduling requirements). Each course is offered for a standard semester.

Table 4: Foundations of Health Informatics Course Offerings by Semester

<b>Fall Semester</b>	<b>Spring Semester</b>
SAT 4650 Applied Computing in Python	SAT 4650 Applied Computing in Python
UN 5550 Introduction to Data Science	UN 5550 Introduction to Data Science

SAT 5001 Introduction to Health Informatics	SAT 5131 Systems Analysis and Design
SAT 5111 Security and Privacy	

## Faculty Qualifications

The following faculty are assigned to teach the curriculum:

- SAT 4650 and SAT 5001 – Weihua Zhou, PhD
  - Assistant Professor, Applied Computing
  - <https://www.mtu.edu/health-informatics/about/people/faculty/zhou-w/>
  - Graduate Faculty
  - Online Instructor Certified
  
- SAT 5317 and SAT 5424 – Guy Hembroff, PhD
  - Associate Professor, Applied Computing
  - Director, Health Informatics Graduate Program
  - <https://www.mtu.edu/health-informatics/about/people/faculty/hembroff/>
  - Graduate Faculty
  - Online Instructor Certified
  
- UN 5550 – Laura Brown, PhD
  - Associate Professor, Computer Science
  - Director, Data Science Graduate Program
  - <https://www.mtu.edu/cs/department/people/faculty/brown/>
  - Graduate Faculty
  
- Additional faculty associated with the Health Informatics program (<https://www.mtu.edu/health-informatics/about/people/>) or Data Science program (<https://www.mtu.edu/data-science/people-groups/faculty/>)

## Program-specific policies, regulations, and rules

No Additional policies, regulation, and rules are needed beyond the existing Health Informatics Graduate Student Handbook.

- [Michigan Technological University - Health Informatics Graduate Student Handbook](#)

## Resources Needed

### Library and other learning resources needed

No additional resources are required.

## Suitability of existing space, facilities, and equipment

No additional space is required for the courses listed in this certificate.

## Program Costs

Initial costs for offering the certificate to students will not incur additional costs but will require continued support for Health Informatics graduate teaching assistantships and/or grading positions. If the online section of the courses requires separate instruction from the on-campus sections, the certificate will also require continued support of the assistantships, as well as agreement and support between the respective department for faculty teaching loads for the online and on-campus sections.

If the enrollment projections are exceeded, the program will require additional support (e.g., the required courses will have more than 50 students and will need to be split into multiple sections or have additional teaching support).