

The University Senate of Michigan Technological University
Proposal 31-23

Establishment of a Graduate Certificate in Public Health Informatics

Basic Program Information

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Program/Degree type: Graduate Certificate

Program Title: Public 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, MIS, and Computer Science.

General description and characteristics of program

The Health Informatics program at Michigan Tech proposes a 9-credit certificate named Public Health Informatics. The graduate certificate has the following three objectives:

1. to attract professionals and students from various disciplines interested in gaining fundamental knowledge of public health informatics;
2. to teach students the standards and skills required in integrating systems and analyzing large clinical data sets for the benefit of public health; and
3. to demonstrate implementing data solutions to assure confidentiality, security, and integrity of large-scale data in the interest of public health.

Rationale

In 2001, the Centers for Disease Control and Prevention's National Center for Environmental Health integrated public health informatics approaches into environmental health practice by developing the Environmental Health Specialists Network Information System (EHSNIS), a web-based application accessible anywhere Internet connectivity is available, including mobile devices (e.g., smartphones, tablets). As computing continues to become ubiquitous, managing and deriving valuable information related to public health is critical. COVID-19 is a recent global example which demonstrates the important work of public health informatics to our society.

This certificate is one of three stackable 9-credit certificates (Artificial Intelligence in

Healthcare and Security and Privacy in Healthcare are the others), which we plan to stack under the 12-credit Foundations of Health Informatics certificate.

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 in public health informatics:

- [Johns Hopkins](#), Baltimore, MD. The program requires 18-credit hours of instruction and focuses on expertise or specialization to work in policy or management of public health.
- [University of Illinois Chicago \(UIC\)](#), Chicago, IL. The 16-credit Public Health Informatics Certificate's objective is to provide knowledge of the basic functions and operations of public health information systems, plan and manage public health information systems projects and have expertise in the requirements for the development or adaptation of public health information systems.
- [University of Minnesota](#), Minneapolis, MN. The program requires 13-credit hours of coursework and prepares students to implement and manage public health information systems such as vital statistics systems, online analytical processing tools that support public health decision-making, immunization registries, population health surveillance, community health information networks and electronic public health data interchange.
- [University of Missouri](#), Columbia, MO. The Department of Health Management and Informatics' online Graduate Certificate in Informatics for Public Health requires 12 credit hours and provides students with basic knowledge of issues and application of informatics in areas of public health including surveillance, prevention, preparedness, and health promotion, and competence in evaluating and discovering solutions for the current and future public health informatics challenges.

Projected Enrollment

We anticipate online professionals looking to advance or enter the public health field and on-campus Michigan Tech graduate students to enroll in the certificate. Given the current level of interests, we expect the program to grow modestly in the next five years, before stabilizing enrollment. If 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: Public 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	10students
Fall 2026	20 students	10 students
Fall 2027	20 students	15 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 recognize the use of informatics to integrate clinical health, environmental risk, and population health data for public health analysis.
2. Upon completing this certificate, students will effectively integrate information systems containing distributed and centralized public and private data sources for the interest of public health.
3. Upon completing this certificate, students will be able to implement solutions that assure confidentiality, security, and integrity of public health data analysis.

Assessment Plan

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

Table 2: GLOs for the Public Health Informatics Graduate Certificate

Assessment Points	Graduate Learning Objectives (GLOs)
Use of informatics in public health.	GLO1
Effectively integrate information systems of public health data.	GL02
Implement solutions to assure confidentiality, security, and integrity of health data	GL03

Curriculum Design

Table 3 illustrates the curriculum design of the required **9 credits** needed for the Public Health Informatics Certificate.

Table 3: Public Health Informatics Certificate Curriculum Design

Course	Name	Credits	Prerequisites	Required or Elective	Semester Offered	On-campus Offering	Online Offering
SAT 5165	Intro. to Big Data Analytics	3 credits	SAT 4650* or equivalent programming course	Required	Fall/Spring	Yes	Yes
SAT 5424	Population Health Informatics	3 credits	Graduate Student	Required	Spring	Yes	Yes
SAT 5317	Medical Internet of Things	3 credits	SAT 4650* or equivalent programming course	Elective	Fall	Yes	Yes
KIP 4740	Epidemiology	3 credits	Graduate Student	Elective	Spring	Yes	No

*SAT 4650 - Applied Computing in Python Programming

- Programming background is an important element of the SAT 5165 and SAT 5317 courses.
- There is no prerequisite for the SAT 4650 course and this course is listed as a foundation course of the MS in Health Informatics
- Students who have programming credits (minimum of 3 credits) in other languages, such as Java, may take the SAT 5165 and SAT 5317 course.

New Course Descriptions

Below lists the description for each required and elective course for the required 9 credits Public Health Informatics Graduate Certificate. Each course already exists in its respective department.

SAT 5165 – Introduction to Big Data Analytics

This course covers concepts and techniques used to analyze big data. The class will cover important big data processing frameworks (e.g., Hadoop, Spark) and GPU techniques. The students will acquire the knowledge of Hadoop architecture, MapReduce, Spark and the capability of programming to analyze big data focusing on various sectors including public health.

SAT 5317 – Internet of Medical Things (IoMT) and Remote Patient Monitoring (RPM)

The course covers various aspects of remote patient monitoring (RPM) and internet of medical things (IoMT) devices. From embedded devices, low-power wireless, edge and cloud computing to data analytics and machine learning to assess patient and population data.

SAT 5424 – Population Health Informatics

This course explores the foundations of population health informatics, including information architecture, data standards and confidentiality. We will examine key concepts related to registries, electronic health records, epidemiological databases, bio-surveillance, health promotion, and quality reporting in population health management.

KIP 4740 - Epidemiology

An introduction to the principles and methods of epidemiology to understand the distribution and determinants of health in a population. Topics include basic epidemiological statistics, study design, and sources/impact of bias and error.

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: Public Health Informatics Course Offerings by Semester

Fall Semester	Spring Semester
SAT 5317 Internet of Medical Things (IoMT) and Remote Patient Management (RPM)	SAT 5165 Introduction to Big Data Analytics
	SAT 5424 Population Health Informatics
	KIP 4740 Epidemiology

Faculty Qualifications

The following faculty are assigned to teach the curriculum:

- 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

- SAT 5165 – Xiaoyong (Brian) Yuan, PhD
 - Assistant Professor, Applied Computing and Computer Science
 - <https://www.mtu.edu/applied-computing/about/faculty/ac-faculty/yuan/>
 - Graduate Faculty
 - Online Instructor Certified

- KIP 4740 – Kelly Kamm, PhD
 - Assistant Professor, Kinesiology, and Integrative Physiology
 - <https://www.mtu.edu/kip/department/faculty-staff/faculty/kamm/>
 - Graduate Faculty

- Additional faculty associated with the Health Informatics program or Kinesiology and Integrative Physiology may also be the instructors for these courses:
<https://www.mtu.edu/health-informatics/about/people/>
<https://www.mtu.edu/kip/department/faculty-staff/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).