

**The University Senate of Michigan Technological University
Proposal 2-24**

**Establishment of a New Graduate Certificate - Foundations in Geographic Information
Science for Natural Resources**

**Submitted by:
College of Forest Resources and Environmental Science**

1. Proposal Date: March 17, 2023

2. Proposing Contacts and Departments: David Flaspohler, Dean and Professor, College of Forest Resources and Environmental Science

3. Sponsor Department Approval: March 17, 2023

4. General Description and Characteristics

4.1. General Description: The courses included in this new online certificate currently exist and have been taught for several years as in person courses. This proposal describes the first of three planned certificates that together can be stacked to comprise a MGIS. Alternatively, individuals can take one certificate alone to boost their knowledge and skills.

The objectives of the nine credit Graduate Certificate in Geographic Information Science (GIS) for Natural Resources are:

Offer a sequence of courses that will allow natural resource professionals to acquire new and advanced skills in GIS.

Provide experience in GIS applications that will give natural resource professionals the confidence to complete more advanced real-world GIS projects or pursue a Masters of GIS degree (See Fig. 1)

Learning objectives: Upon completion of this certificate, the student will be able to analyze and visualize geospatial data in the form of maps using the most widely used GIS software (e.g., ArcMap, ArcGIS Pro, ERDAS IMAGINE)

4.2. Catalog Description: The Graduate Certificate in GIS for Natural Resources provides an overview of the skills needed to be successful in GIS analyses and applications. The certificate includes lectures, computer laboratories, and field experiences.

5. Rationale for the Certificate

With the ability to acquire large amounts of data, there is a growing demand for visualization of spatial data and spatial analyses. The certificate will allow current students to increase their skill sets or use existing skill sets to focus on contemporary software packages. Certificate recipients can leverage their newly acquired skills into new positions to advance their careers. The certificate could also be applied to a Masters of GIS degree program as well.

6. Related Programs

Geographic Information Science and Technology-University of Southern California
<https://gis.usc.edu/online-programs/certificate-geographic-information-science-and-technology-grad/>

Post Baccalaureate Certificate in Geographic Information Systems-Penn State

<https://www.worldcampus.psu.edu/degrees-and-certificates/geographic-information-systems-gis-certificate/overview>

GIS Fundamentals Certificate-University of Wisconsin-Madison

https://pdc.wisc.edu/gis-theme/?utm_source=google&utm_medium=search&utm_campaign=aycinfo_search&utm_content=info_vendi_google_search_gis_responsive_1&qclid=EAlaIQobChMI1MCny8u76qIVD9vACh3EgAbuEAMYAiAAEgL4IfD_BwE

Geographic Information Systems Online Certificate-Lawrence Technological University

https://onlineprograms.ltu.edu/geographic-information-systems/?utm_source=google&utm_medium=cpc&utm_campaign=GIS&utm_term=gis_certificate&qclid=EAlaIQobChMI1MCny8u76qIVD9vACh3EgAbuEAYASAAEgKegvD_BwE

7. Projected Enrollments

Table 1 shows estimated minimum targets assuming a more aggressive marketing approach is deployed. The enrollment cap depends on the number of sections that can be allocated to each course.

Table 1. Estimated minimum enrollment targets by year.

Academic Year	Estimated Minimum Enrollment Targets	
	On-Campus	On-Line
2023-2024	1	2
2024-2025	2	4
2025-2026	3	6
2026-2027	5	8
2027-2028	5	10

8. Scheduling Plans

On-campus sections will not require changes to class scheduling. Online sections will be offered asynchronously with a dedicated instructor to oversee and administer the course.

9. Curriculum

The required and elective course list is shown below with the descriptions given below. All courses below have been offered face-to-face for several years and will be revised to be offered asynchronously online.

Required Courses - 9 credits

FW4545 Map Design with GIS – 2 + 1 credits

FW5550 GIS for Resource Management- 4 credits

FW5554 GPS Field Techniques- 2 credits

Course Descriptions

FW 4545 - Map Design with GIS

Principles of making maps, from traditional to advanced visualization techniques, that convey information which is useful in decision making at many levels. Focus will be on creating maps using GIS software and digital data. A working knowledge of ArcMap is required.

Credits: 2.0 + 1 cr. Final Project

Lec-Rec-Lab: (1-0-3)

FW 5550 - Geographic Information Science for Resource Management

Use of geographic information systems (GIS) in resource management. Studies various components of GIS in detail, as well as costs and benefits. Laboratory exercises use ArcGIS software package to solve resource management problems.

Credits: 4.0

Lec-Rec-Lab: (3-0-3)

FW 5554 - GPS Field Techniques

This course will provide hands-on experience with various types of GPS units and different applications of the technology. These applications include planning, data collection, data processing, and data management. Emphasis will be on practical applications of Global Positioning System technology.

Credits: 2.0

Lec-Rec-Lab: (1-0-3)

Model Schedule Demonstrating Completion Time

Because the classes will be offered asynchronously, students can take the class material at their own pace and start and complete the class at any time. A dedicated course administrator will be available to oversee the course, answer questions, and monitor student progress throughout the calendar year. One possible schedule is shown below.

Fall Semester

FW5550 - 4 cr

FW5554- 2 cr

Spring Semester

FW4545 - 3 cr

10. Library and Other Learning Resources

None

11. Faculty Information

Faculty teaching geospatial courses relevant to this certificate:

Mike Hyslop- FW4545, FW5553, FW5554, FW5556, FW5580

<https://www.mtu.edu/forest/about/faculty-staff/faculty/hyslop/>

Tao Liu-FW5540, FW5541, FW5560

Assistant Professor of Remote Sensing

<https://www.mtu.edu/forest/about/faculty-staff/faculty/liu-t/>

Mickey Jarvi-FW5550, FW5555, FW5557, FW5580

<https://www.mtu.edu/forest/about/faculty-staff/faculty/jarvi/>

12. Equipment

No additional equipment will be needed. Students enrolling in the online classes will need to have their own computer with sufficient GPU memory and RAM (16MB recommended) to run the software used in classes. CFRES has the required licenses for all of the software used in the three classes.

13. Program Costs

The most significant new cost to developing and administering this certificate is the salary for a teaching professor and this has been committed by the CFRES Dean. In year 1, it will come from the difference between the dean and interim dean salary that has been retained in CFRES. Costs will be incurred for developing the online content but this should be covered by CFRES and eventually by the 62% tuition return to the College. Some additional funds will be spent on creating a space for the instructor to have video/audio conversations with students in a sound dampened environment with a higher quality camera and microphone. The Dean had committed funds to supporting this new space.

Projected revenue per semester:

Semester	No. students	Tuition*	MTU share	CFRES share
Spring 2024	2	\$23,148	13,796	\$14,352
Summer 2024	4	\$46,188	\$17,551	\$28,637
Fall 2024	6	\$69,282	\$26,327	\$42,955
Spring 2025	8	\$92,376	\$35,103	\$57,273
Summer 2025	10	\$115,470	\$43,879	\$71,591

*Graduate tuition for MGIS set at fall 2023 levels = \$1,283 x 9 credits = \$11,547

14. Space

No additional space requirements

15. Policies, Regulations, and Rules

None

16. Accreditation Requirements

Michigan Tech is accredited by the Higher Learning Commission (HLC):

<https://www.mtu.edu/provost/accreditation/hlcommission/>

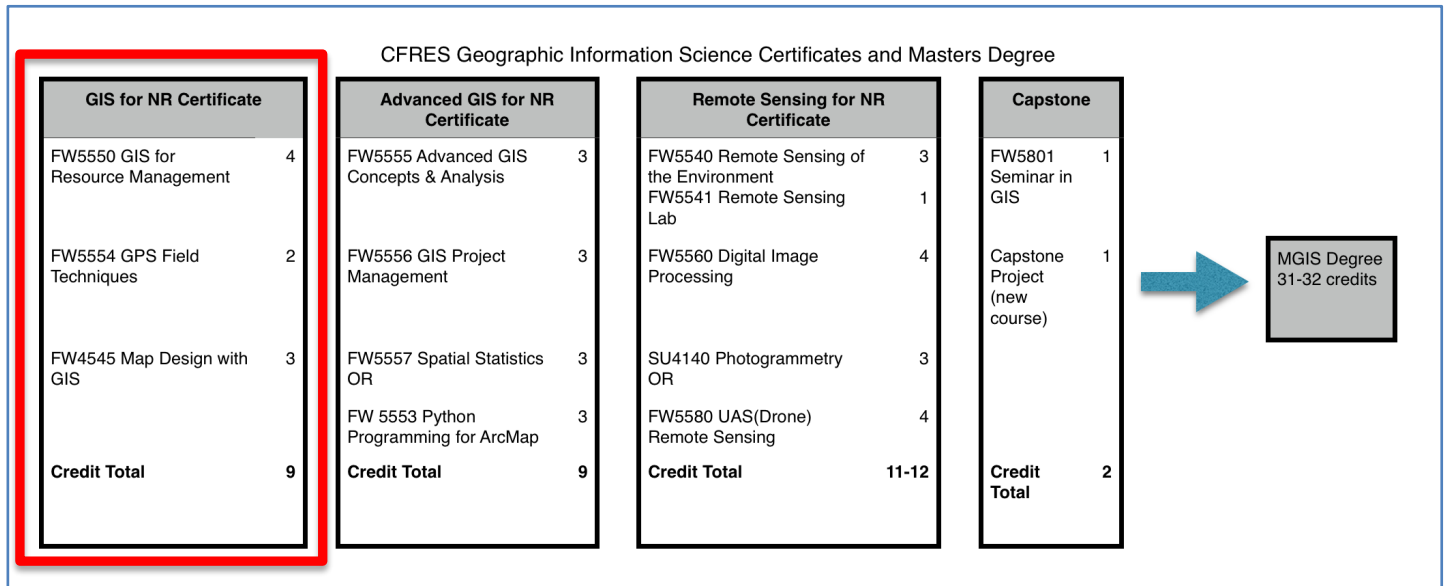
The proposed certificate will not require additional accreditation and will meet HLC criteria 3 and 4.

17. Implementation Date

Spring 2024

18. Assessment

The Graduate Learning Objectives (GLO) of the certificate are listed below with the mapping to assessment points shown in Table 2.



GLO1: Learning objectives include: Upon completion of this certificate, the student will be able to generate visualizations of digital data in the form of maps using the most widely used GIS software (e.g., ArcMap, ArcGIS Pro, ERDAS IMAGINE)

Table 2. Mapping of GLO to assessment points.

Assessment Points	Graduate Learning Objectives (GLO)
These will include embedded exam questions and a culminating final project for FW4545, FW5550 & FW5554.	GLO1
Lab Assessments for FW 4545, FW5550, & FW5554	GLO1

Fig. 1 How the GIS for Natural Resources Certificate Fits into Masters of GIS Program. This proposal is shown in the red box, and is the first of three certificates that, if taken in sequence, comprise a Masters of GIS.

College of Forest Resources and Environmental Science approval: February XX, 2023