June 23, 2020

TO: Members of the Board of Trustees

FROM: Carl W. Lejuez, Ph.D.  
Provost and Executive Vice President for Academic Affairs

RE: New Graduate Remote Sensing and Geospatial Data Analytics Certificate

RECOMMENDATION:

That the Board of Trustees approve a new graduate Remote Sensing and Geospatial Data Analytics Certificate in the College of Agriculture, Health and Natural Resources.

BACKGROUND:

Remote sensing is the science of obtaining information about objects or areas from a distance, typically from aircraft (manned or unmanned), or satellites, or ground-based sensors. Agriculture, environment, business, defense, geointelligence, disaster management, ocean resources, urban planning, and water resources are some of the critical areas where remote sensing is widely used. Remote sensing is a ubiquitous technology that has been seamlessly integrated into modern economies. Over the recent decade, remote sensing has made a radical shift from its traditional role of being the central data engine of geographical information systems (GISs) to an imagery-enabled application horizon. The global market for satellite remote sensing has been projected to reach US$ 7 billion by 2024 in which the United States represents the largest market worldwide.

Despite the remote-sensing market growth and workforce needs, traditional GIS certificate programs overlook the criticality of remote-sensing data analytics in modern applications. The proposed certificate program will be attractive to a broader audience as it aims to resonate market trends and workforce needs. Our remote-sensing certificate program will be the first in the State and one of the few in the Nation. The proposed certificate program is designed to equip students with modern remote sensing technologies to solve real-world problems. Students will complete the certificate program with highly-valued remote sensing knowledge and technical skills. The Remote Sensing and Geospatial Data Analytics Certificate has the potential to generate a significant amount of revenue for UConn and would provide financial support for non-tenure-track faculty and Postdocs in Natural Resources and the Environment.
Remote Sensing and Geospatial Data Analytics Certificate
Add/Create New Certificate Program

General Information
Program Name: Remote Sensing and Geospatial Data Analytics Certificate
Name of sponsoring College: College of Agriculture, Health and Natural Resources
Name of sponsoring Department: Natural Resources and the Environment
Degree Type: Graduate Certificate
Proposed CIP Code(s): 45.0702 (Geographic Information Science and Cartography)
Campus: Program entirely online
Program discussed with CETL? Yes
Entrepreneurial Program approved by the Provost’s Office? Yes
Payment for the program, approved by Provost’s Office: Fee-based

Justification/need for new program:
Remote sensing is the science of obtaining information about objects or areas from a distance, typically from aircraft (manned or unmanned), or satellites, or ground-based sensors. Agriculture, environment, business, defense, geointelligence, disaster management, ocean resources, urban planning, and water resources are some of the critical areas where remote sensing is widely used. Remote sensing is a ubiquitous technology that has been seamlessly integrated into modern economies. Over the recent decade, remote sensing has made a radical shift from its traditional role of being the central data engine of geographical information systems (GISs) to an imagery-enabled application horizon. The global market for satellite remote sensing has been projected to reach US$ 7 billion by 2024 in which the United States represents the largest market worldwide.

Unmanned aerial system technology (UAS, commonly known as drones) is an emerging branch of remote sensing. It has been projected that there is a $100-billion market opportunity in the US for drones, which is driven by growing demand from the commercial and civil government sectors. The unprecedented growth of remote sensing – from satellites to drones – across a multitude of sectors demands a workforce equipped with an advanced skill-set tailored to generate insightful analytics from remote sensing data. Remote sensing is quickly blending with trending data science, artificial intelligence, and cloud computing domains. Employment opportunities are growing due to the increased adaptation of remote-sensing technologies in commercial and government sectors. New sectors are becoming the frontlines of remote sensing
end-users. For example, the construction and engineering sectors are projected to be the number-one user of drone technology.

Despite the remote-sensing market growth and workforce needs, traditional GIS-certificate programs overlook the criticality of remote-sensing data analytics in modern applications. The proposed certificate program will be attractive to a broader audience as it aims to resonate market trends and workforce needs. Our remote-sensing certificate program will be the first in the state and one of the few in the nation. The proposed program would potentially generate a significant amount of revenue for UConn and would provide financial support for non-tenure-track faculty and Postdocs at NRE.

**Are there similar programs in CT or elsewhere?**
In Connecticut there are no similar programs that are specifically tailored to remote sensing technologies and data analytics. The available certificate programs in the State are devoted to the geographical information system (GIS) technology. Those in-state institutions equipped with GIS certificate programs include UCONN, Univ. of New Haven, Eastern Connecticut State University, and Central Connecticut State University. Compared to nation-wide GIS certificate programs, there are comparatively few programs available for remote sensing. Some example institutions that offer remote sensing certificate programs include Pennsylvania State University, Texas A&M University, University of Colorado Boulder, George Mason University. In the New England region, only the Northeastern University offers a remote sensing certificate program.

**What are the desired learning outcomes?**
The proposed certificate program is designed to equip students with modern remote sensing technologies to solve real-world problems. Students will complete the certificate program with highly-valued remote sensing knowledge and technical skills.

Learning outcomes include:
- Understanding remote sensing sensors, platforms, data products, and processing techniques to address real-world applications.
- Applying remote sensing knowledge and skills to professional work or research questions.
- Customizing geospatial software via programming to extend its built-in functionality and to automate repetitive tasks.
- Gaining knowledge on regulatory framework on unmanned aerial systems and operations.

**Program description:**
The proposed certificate program primarily targets the geospatial audience consisting of professionals at all levels of government, military, geointelligence as well as engineering and
environmental consulting groups and other private organizations. The certificate program aims to provide advanced training for students currently working in this field who would like to leverage their skills in this area and acquire the latest knowledge in remote sensing technology. The certificate program requires 12 credits. Students are required to complete two required courses, and two elective courses.


All these courses exist from a Course Catalog perspective, and NRE5585 is already an online graduate course. NRE 5535 and NRE 5545 are under development with CETL currently, and NRE5525 and NRE 5215 are soon to follow.

**Proposed catalog copy:**
This is an online program offered by the Department of Natural Resources and the Environment. The RSGDA program is designed for college graduates and graduate students looking to develop remote sensing knowledge and skills, and working professionals looking to enhance their skills or prepare for a graduate degree program. It takes about 12 to 18 months to complete.

Requirements: The program requires 12 credits total. Six credits come from two required courses; NRE 5525 and NRE 5535. Six additional credits are earned by selecting two of the following four courses; NRE 5215, NRE 5545, NRE 5560, or NRE 5585.

**Faculty involvement:**
- Jason Vokoun (Head, Dept of Natural Resources and the Environment)
- Chandi Witharana (Assistant Research Professor, Dept of Natural Resources and the Environment)
- Zhe Zhu (Assistant Professor, Dept of Natural Resources and the Environment)
- Tom Meyer (Professor, Dept of Natural Resources and the Environment)

**Enrollment and graduation projections:**
Enrollment (graduates):
- Spring 2021 - 5 (0)
- Fall 2021 - 10 (0)
- Spring 2022 - 15 (8)
- Fall 2022 - 20 (10)
- Spring 2023 20 (10)
Program evaluation:
Performance evaluation includes informal and formal assessments to measure and report student and program performance outcomes and impacts. Informal assessments include surveys at the beginning and end of each programmatic year with questions pertaining to students’ knowledge of remote sensing and geospatial data analytics and applications; and actions taken to collaboratively apply knowledge in professional, research, and academic endeavors. These informal assessments will be used to assess if the program is suitable for students to achieve expected outcomes, and to assess the cumulative changes of the program. Success of the program will be measured in terms of changing knowledge, actions, and conditions with respect to program outcomes, as well as increased collaboration among students, faculty, and outside partners.

Formal assessments of the program will target primarily performance outcomes of progress, products, and networking. Progress metrics are time to completion of the graduate certificate and time to first employment opportunity (if the student is not employed) or change in the career level (if the student is employed). Product metrics include number of students graduated from the program, number of graduate certificates awarded to program participants, and number of students participating in one or more program courses. Networking metrics include number of partners engaged in the program and number of internship opportunities. All formal assessments will be conducted during the program. The goal for tracking students post-completion is 100% contact rate. All students will be required to maintain current contact information with the program coordinator upon completion of the certificate program.

Program administration:
The remote sensing graduate certificate will be administered by the Department of Natural Resources and the Environment, with advising and oversight provided by a program Coordinator reporting to the head of NRE. Any programmatic changes stemming from program evaluation or otherwise would be decided by the coordinator, NRE department head, and the NRE Courses and Curricula committee. Applications will be evaluated by the NRE Graduate Admissions Committee, with admission recommendations of the committee sent to the Graduate School by the Coordinator.

Funding and financial resources:
The remote sensing certificate program coordinator will be partially supported with entrepreneurial revenues generated by this program. Staffing for three courses is provided by existing tenure track faculty, the remainder will be taught by the program coordinator (non-tenure track) and post-doctoral scholars as adjuncts. The Center for Excellence in Teaching and Learning and eCampus will provide necessary technical, administrative, and online course development support.
Other resource needs:
No additional or unique resources are required for program success.

Consultations with other potentially affected units:
The proposed remote sensing certificate program compliments the under development new GIS MS program from the Dept of Geography (we have been co-planning these programs) and the campus-wide Data Science online initiative. An email confirmation of support from Geography was provided by the Department Head of Geography.

Who can apply to this program?
- Internal applicants (current UConn students enrolled in another degree or certificate program)
- External applicants (individuals who are not currently UConn students)

Anticipated term and year of first enrollment:
Spring 2021

Admissions Requirements
There are no official course requirements for admission to the remote sensing graduate certificate. A background in GIS/Remote Sensing will be helpful but is not assumed. Professional experience in related fields (e.g., Engineering, Geoscience, Geography, Environmental Science, Ecology) or academic degree in those fields are preferred for acceptable progress through the program.

Terms to which students will be admitted:
- Fall
- Spring

Anticipated application deadline:
- Rolling

Initiator, Administrative Contact, & Program Director: Chandi Witharana, Natural Resources and the Environment, chandi.witharana@uconn.edu, 860-486-8732