UNIVERSITY SYSTEM of MARYLAND

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Board of Regents
Committee on Education Policy and Student Life

Tuesday, March 5, 2019
9:30 a.m.
University of Maryland, Baltimore County

Agenda
Public Session

Action Items

1. New Academic Program Proposals
    a. University of Maryland, College Park: Master of Science in Applied Economics
    b. University of Maryland, College Park: Master of Science in Geospatial Information Sciences
    c. University of Maryland, College Park: Master of Science in Geospatial Intelligence

2. Proposals of New Academic Titles and Ranks
    a. University of Maryland, Baltimore
    b. University of Maryland, Baltimore County

3. Proposed USM Student Council Constitutional Amendments

Information Items

4. Update: Civic Education and Civic Engagement Efforts

5. Update: USM P-20 Initiatives

Action Item

6. Motion to Adjourn

UNIVERSITY SYSTEM of MARYLAND

BOARD OF REGENTS

SUMMARY OF ITEM FOR ACTION, INFORMATION, OR DISCUSSION

TOPIC: University of Maryland, College Park: Master of Science in Applied Economics

COMMITTEE: Education Policy and Student Life

DATE OF COMMITTEE MEETING: Tuesday, March 5, 2019

SUMMARY: Since fall 2012, the University of Maryland, College Park has offered a Master of Professional Studies (MPS) in Applied Economics. The intent of this proposal is to create a stand-alone Master of Science (MS) in Applied Economics. The curriculum for the proposed MS in Applied Economics will comprise of the core and field courses that already exist in the MPS in Applied Economics. The degree change to a master's of science allows the Applied Economics program to be properly designated as a Science, Technology, Engineering, and Math (STEM) program in the Federal Classification of Instructional Programs (CIP). The assignment of a STEM CIP will attract more highly-skilled domestic and international students to the program.

In addition, the master's degree has become an important credential in the economics profession. Until recently, most professional analysists in the profession seeking a graduate credential enrolled in a PhD program in economics that did not require a master's degree or took different career paths. Increasingly there is a growing pool of research analysists seeking careers as applied economists who wish to pursue a master's degree as their next credential before embarking upon the Ph.D. Furthermore, many employers, including several federal government agencies, are now requiring a master's degree for employment and/or advancement beyond an entry-level position when the Ph.D. is not required. The proposed MS in Applied Economics will highly support the need for qualified professionals to meet the workforce credential gap in the economics profession.

ALTERNATIVE(S): The Regents may not approve the program or may request further information.

FISCAL IMPACT: No additional funds are required. The program can be supported by the projected tuition and fees revenue.

CHANCELLOR'S RECOMMENDATION: That the Education Policy and Student Life Committee recommend that the Board of Regents approve the proposal from the University of Maryland, College Park to offer the Master of Science in Applied Economics.

COMMITTEE RECOMMENDATION:		DATE: March 5, 2019
BOARD ACTION:		DATE:
SUBMITTED BY: Joann A. Boughman	301-445-1992	jboughman@usmd.edu

UNIVERSITY OF MARYLAND
OFFICE OF THE PRESIDENT

Main Administration Building
College Park, Maryland 20742
301.405.5803 TEL 301.314.9560 FAX

February 4, 2019

Chancellor Robert L. Caret
University System of Maryland
3300 Metzerott Road
Adelphi, MD 20783

Dear Chancellor Caret:

I am writing to request approval for a new Master of Science program in Applied Economics. The proposal for the new program is attached. I am also submitting this proposal to the Maryland Higher Education Commission for approval.

The proposal was endorsed by the appropriate faculty and administrative committees. I also endorse this proposal and am pleased to submit it for your approval.

Sincerely,

Wallace D. Loh
President

MDC
cc: Antoinette Coleman, Associate Vice Chancellor for Academic Affairs
Mary Ann Rankin, Senior Vice President and Provost
Gregory Ball, Dean, College of Behavioral and Social Sciences

UNIVERSITY SYSTEM OF MARYLAND INSTITUTION PROPOSAL FOR

X	New Instructional Program
	Substantial Expansion/Major Modification
	Cooperative Degree Program
	Within Existing Resources, or
	Requiring New Resources

University of Maryland, College Park
Institution Submitting Proposal

Applied Economics
Title of Proposed Program

Master of Science
Award to be Offered

Fall 2019
Projected Implementation Date

220401
Proposed HEGIS Code

45.0603
Proposed CIP Code

Economics
Department in which program will be located

John Straub
Department Contact

301-405-3531
Contact Phone Number

straub@umd.edu
Contact E-Mail Address

Signature of President or Designee

2/4/19
Date

A. Centrality to the University's Mission and Planning Priorities

Description.

Overview and Purpose. Since fall 2012, the University of Maryland, College Park has been offering an iteration of its Master of Professional Studies (MPS) in Applied Economics. The intent of this proposal is to move the existing curriculum out from under the MPS umbrella and create a stand-alone Master of Science (MS) in Applied Economics. This change would allow the Applied Economics program to be properly designated as a Science, Technology, Engineering, and Math (STEM) program in the Federal Classification of Instructional Programs (CIP). Assigning the proper CIP number to the curriculum will help attract more highly skilled domestic and international students. For domestic students, a STEM designation will enhance their scholarship applications and opportunities for career improvement. For international students, the additional 24 months of Optional Practical Training (OPT) that is permitted for STEM-designated programs will benefit their future job searches.

The program's curriculum will be the same as the existing MPS iteration. Housed in the Department of Economics within the University of Maryland College of Behavioral & Social Sciences, the proposed MS in Applied Economics program will continue the curriculum of the nationally ranked MPS program (Ranked #3 in the Financial Engineer's ranking of US economics master's degree programs and Ranked #10 in the ranking by College Choice). Focusing on the application of modern economic analysis to public policy questions, the 10-course, 30-credit MS in Applied Economics will continue to emphasize the role of applied econometric analysis, with a particular focus on real-world policy-relevant examples. Like the current MPS, the proposed MS in Applied Economics will continue to provide rigorous training in economic reasoning, formulating and estimating economic models, and utilizing quantitative methods to evaluate policy proposals and programs.

Relation to Strategic Goals. In a world that is becoming increasingly complex, where success is driven not only by *what* you know, but by what you *can do* with what you know, it is more important than ever for students to be equipped with the knowledge and skills to solve tough problems, gather and evaluate evidence, and make sense of information. These are the types of skills that students will develop in the proposed MS in Applied Economics program. Specifically, the proposed MS in Applied Economics contributes to the University's mission to "advance knowledge in areas of importance to the State, the nation, and the world." The MS in Applied Economics will continue to extend the university's learning community beyond the campus boundaries and fill demonstrated needs at the State and Federal level.

Funding. As previously noted, the Economics Department already offers a self-supported MPS in Applied Economics and has existing faculty and facilities in College Park and Washington, DC to support the program. The proposed change from an MPS to an MS does not require the development of any additional courses or the hiring of additional faculty. As it has been with the current MPS, tuition revenue for the proposed MS in Applied Economics will provide funding to pay all program expenses (e.g., salaries, benefits, program materials, and physical resources).

Institutional Commitment. The Economics Department has already secured the administrative, instructional, advising, and facilities infrastructure that are required to operate the proposed MS in Applied Economics program. Reporting to the Department Chair and to the Director of Graduate Studies, the Applied Economics Program Director serves as the academic adviser to all students. Two

part-time program coordinators support the Program Director—one for the semester-based program in College Park, and one for the quarter-based program in Washington, DC.

In the unlikely event that the program is no longer financially viable, program faculty and staff would continue to support and teach the necessary courses to allow enrolled students to complete their degree within a reasonable and customary period of time.

B. Critical and Compelling Regional or Statewide Need as Identified in the State Plan

Need. Over the last seven years, the current MPS program has been taught by faculty from the Economics Department and by other PhD economists working at some of the most prominent and influential private, governmental, and non-governmental organizations in the greater Washington DC area. These highly qualified practitioners have developed specific course syllabi that provide the precise training that students need to be successful analysts in the same kinds of organizations that currently employ many of the program's adjunct faculty. Graduates from the current MPS in Applied Economics program have been recruited and hired by a variety of employers including Federal Government Agencies, International Organizations (e.g., World Bank, International Monetary Fund), and private consulting firms.

In conjunction with the undergraduate program in the Economics Department and the UMD Career Center, the Applied Economics program organizes recruiting events in October and February of each year. The employment rate for Applied Economics graduates has been outstanding since the program's inception. In calendar 2016, 26 of 27 graduates were employed in the field within three months of graduation. In calendar 2017, 44 of 45 graduates were employed within three months of graduation. For the May 2018 graduates, 26 of the 28 domestic graduates are now working in the economics field as applied economists. The high employment rates for Applied Economics graduates are a testament to the need for skilled economists and the value that employers place on the training students receive in the Applied Economics master's program.

State Plan. The proposed MS in Applied Economics program aligns with the emphasis on career training highlighted in the *Maryland State Plan for Postsecondary Education*. Specifically, strategy number seven of the *Maryland State Plan* identifies a need to "Enhance career advising and planning services and integrate them explicitly into academic advising and planning."[1] A substantial focus of the Applied Economics program revolves around employment preparation. Throughout the program, students have access to faculty, staff, and guest lecturers who provide career planning assistance, resume and cover letter editing, and internship opportunities. The vast majority of students begin working at jobs and internships well before they graduate, which results in valuable peer-to-peer networking opportunities as well. The Applied Economics program also advances the need for expanding educational opportunities and choices for minority and educationally disadvantaged students in institutions of higher education. Since inception, approximately 34% of the students served in the Applied Economics program identify as belonging to groups underrepresented in higher education.

C. Quantifiable and Reliable Evidence and Documentation of Market Supply and Demand in the Region and State

[1] Maryland Higher Education Commission. (2017). *Maryland State Plan for Postsecondary Education.* (p. 60). Retrieved October 29, 2018 from: http://www.mhec.state.md.us/About/Documents/2017.2021%20Maryland%20State%20Plan%20for%20Higher%20Education.pdf.

Since its inception, more than 90% of the program's domestic graduates have found employment in the economics field within three months of graduation. Of the five international graduates in the 2018 graduating class who are still in the US, three are working at OPT internships, one is still seeking an internship, and the other has enrolled in a subsequent graduate program at George Washington University.

The US Bureau of Labor Statistics handbook lists the number of jobs for economists as growing by 6% between 2016 and 2026, with those with a graduate degree having the best prospects.[2] The state of Maryland Labor, Licensing, and Regulation department shows economist positions increasing by 3.8% by 2026.[3] The actual job prospects for graduates of this program extend beyond this narrow category, however, as economic analysis is a skill that is necessary in a variety of industries and professions. In the last 3 years, graduates of the program have been hired many organizations, which are identified in Appendix D.

D. Reasonableness of Program Duplication

The current MPS in Applied Economics at UMD has co-existed with the MS in Applied Economics offered at Johns Hopkins University since the fall of 2012. The demonstrated demand for the economics education, along with UMD's substantially lower tuition rate ($32,500 compared to $43,850), justifies the need and anticipated continued success of the Applied Economics program at UMD.

E . Relevance to Historically Black Institutions (HBIs)

Morgan State University offers a Master of Arts in Economics through its College of Liberal Arts. As with the MS in Applied Economics at Johns Hopkins, the programs have successfully co-existed since 2012 because of sufficient market demand, and complementary geographical reach. The only potential impact that is anticipated from converting UMD's Applied Economics degree from MPS to MS is the enhancement of internship opportunities available to international students and graduates of the UMD's program.

F. Relevance to the identity of Historically Black Institutions (HBIs)

The UMD has already been offering the MPS in Applied Economics since 2012. The UMD has also been offering Bachelor's and PhD programs in economics for decades. Converting the UMD's Applied Economics degree from an MPS to an MS degree would not have an impact on the uniqueness of institutional identity of any Maryland HBIs.

G. Adequacy of Curriculum Design, Program Modality, and Related Learning Outcomes

Curricular Development. When the program was established as an MPS, economics faculty were primarily responsible for developing the program's curriculum. Based mostly on their world-class academic research, our economics department is consistently ranked among the top 20-30 departments in the US. Many of our faculty also have strong ties to applied work being done in many policy-relevant

[2] US Bureau of Labor Statistics. (April 30, 2018). *Occupational Outlook Handbook: Economists*. Retrieved from: https://www.bls.gov/ooh/life-physical-and-social-science/economists.htm.
[3] Maryland Department of Labor, Licensing & Regulation. (January 31, 2019). Maryland Occupational Projections – 2016-2026 – Workforce Information and Performance. Retrieved from http://www.dllr.state.md.us/lmi/iandoproj/maryland.shtml.

areas. Over the last 7 years, we have staffed the program's courses with members of our department's teaching faculty, and with PhD economists working at the DC area's many private, governmental, and non-governmental organizations. These highly qualified practitioners have developed specific course syllabi that provide exactly the kind of training that students need to be successful analysts in the same kinds of organizations where many of our instructors work.

Faculty Oversight. The program will be housed in the Economics Department in the College of Behavior & Social Sciences and taught by department faculty who have extensive academic and industry experience. See appendix B for a complete list of faculty credentials. Dr. John Straub, will continue to serve as the Program Director and have overall responsibility for all academic aspects of the program. The proposed program will continue to be administered through the UMD's Office of Extended Studies.

Educational Objectives and Learning Outcomes. In preparation for career paths in Economics, the proposed MS in Applied Economics program will train students with the objective of developing the following skills:

1. The collect, evaluate, understand and analyze economic data.
2. To understand and interpret statistical results and apply empirical evidence to economic arguments.
3. To articulate and apply standard macroeconomic theories and models to policy discussions.
4. To articulate and apply standard microeconomic theories and models to policy discussions.
5. To interpret and communicate economic models to a wider audience.
6. To measure and evaluate the effectiveness of policy programs using sound econometric techniques.

Institutional assessment and documentation of learning outcomes.
As with the current MPS in Applied Economics, the proposed MS in Applied Economics will utilize the assessments outlined below:

- Survey of Graduates
  Graduates of the program will be asked to complete a survey to address the relevance of the program's course material to their current professional activities. Respondents will be asked to describe the value of the course material in providing quantitative tools for policy analysis. Surveys will be distributed at the time of graduation and one year after graduation to assess placement and program relevance to current and potential employment opportunities. Surveys are not anonymous, which allows the program to track placement and identify internship opportunities with organizations that employ graduates of the Applied Economics program.

- Advisory Group
  An advisory group reviews the results of the assessment methods and, based on examination results and graduate responses, provides direction to continually refine and improve the degree program. The advisory group includes the Department of Economics Chair, Director of Graduate Studies, and the Director of the current MPS.

Since 2011, the program's Learning Outcomes Assessment practice requires instructors to assess students during their final term in the program. The assessments were along dimensions that match the program's six learning outcomes. To assess outcomes five and six, instructors are asked to provide assessments based on student presentations in two courses. One of the courses (ECON 643) is taken in

students' first term. The other course (ECON 672) is taken in students' final term. Data from faculty assessments in these two courses provide the foundation for assessing students' abilities to interpret and communicate economic models to a wider audience, and to measure and evaluate the effectiveness of policy programs using econometric techniques.

Course requirements. The curriculum for the proposed MS in Applied Economics is identical to the curriculum in the current MPS. The program consists of 30 credits organized into the following categories:

- Five core courses that provide foundational knowledge required for all fields
- Five field courses that allow students to specialize in areas of interest

Course	Course (Credits)	12-Week Term Calendar	Semester-Calendar
Core Courses			
ECON 641	Microeconomic Analysis (3)	I	Year 1 Fall
ECON 643	Empirical Analysis I: Foundations of Empirical Research (3)	I	Year 1 Fall
ECON 642	Topics in Applied Macroeconomics (3)	II	Year 1 Fall
ECON 644	Empirical Analysis II: Introduction to Economic Models (3)	II	Year 1 Spring
ECON 645	Empirical Analysis III: Econometric Modeling and Forecasting (3)	III	Year 2 Fall
Field Courses			
ECON 670	Financial Economics (3)	III, IV or V	Year 1 or 2 Spring
ECON 671	Economics of Health Care (3)	III, IV or V	Year 2 Fall
ECON 672	Program Analysis and Evaluation (3)	III, IV or V	Year 2 Spring
ECON 673	Information, Game Theory and Market Design (3)	III, IV or V	Year 1 or 2 Spring
ECON 674	Economic Analysis of Law (3)	III, IV or V	Year 1 or 2 Spring
ECON 675	Environmental Economics (3)	III, IV or V	Year 2 Fall
ECON 676	Economic Development (3)	III, IV or V	Year 2 Fall
ECON 683	International Macroeconomics and Finance (3)	III, IV or V	Year 2 Fall
ECON 684	Time Series Analysis and Advanced Forecasting (3)	III, IV or V	Year 2 Spring

See Appendix A for course descriptions.

General Education Requirements:
Not Applicable

Accreditation or Certification Requirements. There are no specialized accreditation or certification requirements for this program.

Other Institutions or Organizations.
Not applicable.

Student Support. The current MPS and proposed MS program will be administered by the Office of Extended Studies, which will assist students with:

A. Admissions, providing assistance with general questions, confirmation, and deferment.
B. Registration for approved program courses only, including:
    1. Instructions and assistance with the University's standard online registration system,
    2. Knowledge of academic policies as related to cancellation, withdraw, and other academic deadlines, and
    3. Liaising with Office of the Registrar for troubleshooting student issues.
C. Billing and Payment, providing billing information, payment instructions, and financial deadlines. Liaison with Financial Aid, Veterans Office, Student Financial Services, Third Party Billing. Cancellation for non-payment and re-instatement.
D. Graduation, providing information with access to forms and deadlines.
E. Appeals Process: academic and financial.
F. Other Campus Services, including grades, transcripts, library services, troubleshoot issues with the Division of Information Technology (faculty and students).

Marketing and Admissions Information. The program will be clearly and accurately described on the Economics Department website and the Office of Extended Studies website. Any marketing materials that are produced will adhere to standards and guidelines in the UMD Brand Toolkit to ensure appropriate, professional, and effective communication.

H. Adequacy of Articulation

As a graduate program, articulation is not applicable.

I. Adequacy of Faculty Resources

Program faculty. A combination of PhD economists affiliated with the University of Maryland as either full-time faculty or part-time faculty who are professionals working in the field will teach the Applied Economics courses. Core courses are generally taught by full-time faculty, whereas the field (elective) courses are generally taught by adjunct faculty whose professional experience ranges from government agencies, private firms, and NGOs. See Appendix B for faculty credentials and courses taught.

Faculty training. Opportunities to improve teaching and learning in the program are identified through program assessment process as described in Section M. UMD's Teaching and Learning Transformation Center provides instructional training resources, support, and consultations to instructors across the university.

For the learning management system, faculty teaching in this program will have access to teacher development opportunities available across campus, including those offered as part of the Teaching and Learning Transformation Center. For online elements of the coursework, instructors will work with the learning design specialists on campus to incorporate best practices for learning within an online environment.

J. Adequacy of Library Resources

The University of Maryland Libraries has conducted an assessment of library resources required for this program. The assessment concluded that the University Libraries are able to meet the curricular and research needs of the program with its current resources.

K. Adequacy of Physical Facilities, Infrastructure, and Instructional Resources

The facilities, infrastructure, and instructional equipment that are already in existence are adequate to handle the demands of the proposed program and the course offerings within the program. For the quarter-based program in Washington, DC, students attend classes in a suite located at 1400 16th Street, NW that contains two classrooms, two small offices, a reception area, a small kitchen, and a lounge/group study area. The building in DC also has a large conference space that tenants can rent for well below the going rate for conference space in the DuPont Circle neighborhood. The Economics Department uses the conference space for information sessions, recruiting/placement events, and academic seminars. The space has worked well for the program and has been approved as an additional location by the Middle States Higher Education Commission and the DC Higher Education Licensure Commission. The current lease runs through March of 2020.

All classes in College Park meet in the evening from 6:30 p.m. to 9:15 p.m. when there is ample classroom space on campus. The Economics Department has also allocated Morrill Hall, room 1102 for office space related to the master's program. The space includes offices for the Program Director and the College Park Program Coordinator, an office for program instructors to use before class, and an office for the Economics PhD students who serve as Teaching Assistants (TAs) and graders in the master's program. There is also a lounge/group study area for students in the master's program.

All UMD students have access to the institutional electronic mailing system. This program is not a distance education program; however, students will have access to the campus learning management system for the elements of the courses that exist online.

L. Adequacy of Financial Resources

Administration of the program is provided by the University's Office of Extended Studies. The proposed change from an MPS to an MS does not require the development of any additional courses or the hiring of additional faculty to teach courses. As it has with the current MPS, tuition revenue for the proposed MS in Applied Economics will provide funding to pay all program expenses (e.g., salaries, benefits, program materials, and physical resources). Resources and expenditures in the program, as it has been operating, are included in Appendix C.

M. Adequacy of Program Evaluation

Formal program review is carried out according to the University of Maryland's policy for Periodic Review of Academic Units, which includes a review of the academic programs offered by, and the research and administration of, the academic unit. Program Review is also monitored following the guidelines of the campus-wide cycle of Learning Outcomes Assessment. Faculty within the department are reviewed according to the University's Policy on Periodic Evaluation of Faculty Performance. Since 2005, the University has used an online course evaluation instrument that standardizes course evaluations across campus. The course evaluation has standard, university-wide questions, and also allows for specialized questions to be added by the academic unit offering the course.

N. Consistency with Minority Student Achievement goals

The Economics Department adheres to the UMD's diversity goals as stated in the *Mission and Goals Statement* that highlights a goal of "providing equal educational opportunity, hiring and retaining a diverse faculty and staff of exceptional achievement, and recruiting and graduating talented students from traditionally underrepresented groups are institutional priorities."[4]

Once admitted, specific retention efforts will be employed to ensure the success of all students in the program. The program will:

- Employ a strong, faculty-directed advising model, in which students will be supported to examine their individual career and life goals and to design and succeed in required and field courses that best facilitate those outcomes;
- Ensure that all courses address theory and research which examine central issues related to the (a) influence of diversity on growth and development and (b) practical implications for application of course content in diverse professional work-related and educational settings;
- Assist students in identifying and securing the most personally relevant and meaningful internship and service learning placements;
- Assist students in the design and implementation of an internship experience related to the student's career goals.

Learning outcomes associated with these projects will measure students' understanding of the needs of target populations of varying age, gender, race, and ethnicity.

O. Relationship to Low Productivity Programs Identified by the Commission

Not Applicable

P. Adequacy of Distance Education Programs

Not Applicable

[4] University of Maryland, College Park. (April 29, 2014). *Mission and Goals Statement.* (p. 1). Retrieved November 15, 2018 from https://www.provost.umd.edu/Documents/UMCP-Mission-Statement-Final-2015.pdf.

Appendix A: Course Descriptions

ECON641 Microeconomic Analysis. 3 credits. Prerequisite: Admission to the Master of Science in Applied Economics. This course covers microeconomic analysis applied to public policy problems with an emphasis on practical examples and how they illustrate microeconomic theories. Policy issues such as pollution, welfare and income distribution, market design, industry regulation, price controls, tax policy, and health insurance are used to illustrate the abstract principles of microeconomics.

ECON642 Topics in Applied Macroeconomics. 3 credits. Prerequisite: Admission to the Master of Science in Applied Economics. In this course, focus is on applied macroeconomic models used by federal agencies to explain and predict economic behavior. Course emphasizes macroeconomic data: NIPA accounts, GDP, construction and application of CPI, labor force data, and economic indicators. Students will also study a selected set of current macroeconomic topics including models of economic growth, economic fluctuations, monetary policy, the Great Recession, inflation, and financial markets.

ECON643 Empirical Analysis I: Foundations of Empirical Research. 3 credits. Prerequisite: Admission to the Master of Science in Applied Economics. Fundamental aspects of data management and interpretation emphasizing sampling, descriptive statistics, index numbers and construction of aggregated variables. Students will learn basic probability theory and statistics. The course will include an introduction to simple regression analysis using STATA statistical software.

ECON644 Empirical Analysis II: Introduction to Economic Models. 3 credits. Prerequisite: ECON 643. An introduction to econometric methods with applications to public policy analysis. Primary focus on application and interpretation of multiple regression analysis.

ECON645 Empirical Analysis III: Econometric Modeling and Forecasting. 3 credits. Prerequisite: ECON 644. Study of empirical techniques that are particularly relevant to the analysis of microeconomic models. Emphasis is on advanced panel data methods, time series regressions, instrumental variables, limited dependent variables, and sample selection corrections.

ECON670 Financial Economics. 3 credits. Prerequisite: ECON 641 and ECON 644 (can be taken concurrently with ECON 644). This course applies microeconomic theory and applied econometric techniques to the study of financial institutions and markets for financial assets. Students will learn how economists model and estimate the value of financial assets. The economic and empirical models are of interest to public policy makers and private wealth managers. Specific topics can include financial intermediation, the regulation of financial institutions, risk management, portfolio theory, the capital asset pricing model and the efficient markets hypothesis.

ECON671 Economics of Health Care. 3 credits. Prerequisite: ECON 641 and ECON 645 (can be taken concurrently with ECON 645). This course is an examination of the structure, conduct, and performance of the health care market including physician services, the pharmaceutical industry, the hospital market, and health insurance using quantitative and analytic economic tools. Special emphasis is on regulatory response to market imperfections.

ECON672 Program Analysis and Evaluation. 3 credits. Prerequisite: ECON 641 and ECON 645. Students study the tools used to evaluate the effectiveness of public policies. All evaluations have weaknesses, and some have more weaknesses than others. You will learn how to distinguish high from low quality evaluations. We will discuss the basic economics and econometrics of program evaluation,

focusing on the application of methods used for causal inference and cost-benefit analyses in public policy contexts. We will examine published evaluation research with the intent of showing how the research does or does not lead to clear conclusions regarding program performance.

ECON673 Information, Game Theory and Market Design. 3 credits. Prerequisite: ECON 641 and ECON 644 (can be taken concurrently with ECON 644). A study of the strategic decision-making and the theory and practice of market design. Focus is on the design of organized market and incentives created by market rules. Topics include online auction markets, government auctions procurement auctions and matching markets. The analysis includes documenting the rules of real-world markets, game theoretic analysis, empirical analysis, and experimental work.

ECON674 Economic Analysis of Law. 3 credits. Prerequisite: ECON 641 and ECON 644 (can be taken concurrently with ECON 644). A study of the application of economics to law with a focus on game theory, strategic behavior and public policy.

ECON675 Environmental Economics. 3 credits. Prerequisite: ECON 641 and ECON 645 (can be taken concurrently with ECON 645). A study of the nature of environmental regulation focusing on U.S. environmental policies and policy debates.

ECON676 Economic Development. 3 credits. Prerequisite: ECON 641, ECON642 and ECON 644 (can be taken concurrently with ECON 644). Analysis of economic development. The course will focus on the consequences of poverty and poor institutions for the behavior and welfare of individuals, households, firms and the aggregate economy in developing countries. Theoretical models and empirical evidence will be used to understand the intended and unintended consequences of policies designed to enhance economic development.

ECON683 International Macroeconomics and Finance. 3 credits. Prerequisite: ECON 642 and ECON 644 (can be taken concurrently with ECON 644). Economic analysis of international macroeconomic issues and policy. Topics can include the study of exchange rates, balance of payments, international financial markets, international business cycles, contagion, and the roles played by international economic institutions.

ECON684 Applied Time Series Analysis and Forecasting. 3 credits. Prerequisite: ECON 642 and ECON 645. Students will learn the theory of stationary processes and how it applied to econometric techniques for estimation and forecasting based on time series data. The techniques will be applied in macroeconomic, financial and business applications.

Appendix B. Faculty

Full-Time Faculty

Hossein Abassi
Full-time Lecturer, UMCP
University of Illinois at Urbana-Champaign, 2009
Courses: ECON644

Aaron Finkle
Full-time Lecturer, UMCP
Ph.D., Economics, University of Washington–Seattle, 2004
Courses: ECON641

Richard Stahnke
Full-time Lecturer, UMCP
Ph.D., Economics, Columbia, 1999
Courses: ECON641, ECON670

John Straub
Full-time Lecturer, UMCP
Executive Director, Master's Degree Program in Applied Economics, UMCP
Ph.D., Economics, University of Wisconsin-Madison, 2001
Courses: ECON641, ECON 642, ECON643, ECON645

Part-Time Faculty

Aditya Aladangady
Economist, Federal Reserve Board of Governors
Part-Time Adjunct Lecturer, UMCP
Ph.D., Economics, University of Michigan, 2014
Courses: ECON642

Mike Barry
Associate Professor of Economics and Law, Mount St. Mary's University
Part-Time Adjunct Lecturer, UMCP
Ph.D., Economics, University of Wisconsin-Milwaukee, 1998
Courses: ECON642, ECON674, ECON684

Maksim Belenkiy
International Economist, US Department of Commerce, International Trade Administration
Part-Time Adjunct lecturer, UMCP
Ph.D., Economics, University of California, Santa Cruz, 2010
Courses: ECON641, ECON644, ECON677

David Burk
Economist, Congressional Budget Office

Part-Time Adjunct Lecturer, UMCP
Ph.D., Economics, University of Chicago, 2014
Courses: ECON674, ECON684

Chris Dockins
Senior Economists at the US Environmental Protection Agency
Part-Time Adjunct Lecturer, UMCP
Ph.D., Economics, Duke, 1996
Courses: ECON675

Cynthia Doniger
Economist, Federal Reserve Board of Governors
Part-Time Adjunct Lecturer, UMCP
Ph.D., Economics, University of Michigan, 2014
Courses: ECON642

Thiago Ferreira
Economist, Board of Governors of the Federal Reserve
Part-Time Adjunct Lecturer, UMCP
Ph.D., Economics, Northwestern University, 2014
Courses: ECON684

Mahsa Gholizadeh
Economist, US Bureau of Economic Analysis
Part-Time Adjunct Lecturer, UMCP
Ph.D., Economics, American University, 2015
Courses: ECON683

Charles Griffiths
Research Economists at the US Environmental Protection Agency
Part-Time Adjunct Lecturer, UMCP
Ph.D., Economics, UMCP, 1997
Courses: ECON675

Misty Heggeness
Chief, Longitudinal Research, Evaluation, and Outreach Branch, U.S. Census Bureau
Part-Time Adjunct Lecturer, UMCP
Ph.D. Applied Economics, University of Minnesota, 2010
Courses: ECON672

Joanne Hsu
Senior Economist, Board of Governors of the Federal Reserve
Part-Time Adjunct Lecturer, UMCP
Ph.D., Economics, University of Michigan-Ann Arbor, 2011
Courses: ECON672

Hong Kim
Labor Economist, US Department of Labor

Part-Time Adjunct Lecturer, UMCP
Ph.D., Applied and Resource Economics, University of California-Davis, 1994
Courses: ECON 675

Marquise McGraw
Economist, US Consumer Financial Protection Bureau
Part-Time Adjunct Lecturer, UMCP
Ph.D., Economics, University of California–Berkeley, 2015
Courses: ECON645

Marina Miller
Principal Analyst, Congressional Budget Office
Part-Time Adjunct Lecturer, UMCP
Ph.D., Economics, University of California–San Diego, 2015
Courses: ECON643

Oscar Mitnik
Principal Economist, Inter-American Development Bank
Part-Time Adjunct Lecturer, UMPC
Ph.D., Economics, University of California–Los Angeles, 2004
Courses: ECON676

Ryan Nunn
Fellow, Economic Studies Program, Brookings Institution
Part-Time Adjunct Lecturer, UMCP
Ph.D., Economics, University of Michigan-Ann Arbor, 2012
Courses: ECON672

David Ovadia
Economist, Federal Trade Commission
Part-Time Adjunct Lecturer, UMCP
Ph.D., Economics, Northwestern University, 2015
Courses: ECON673

Nathan Petek
Economist, Federal Trade Commission
Part-Time Adjunct Lecturer, UMCP
Ph.D., Business, University of Chicago, Booth School of Business, 2016
Courses: ECON671

Lubomir Petrasek
Principal Economist, Federal Reserve Board of Governors
Part-Time Adjunct lecturer, UMCP
Ph.D., Finance, Penn State University, 2011
Courses: ECON670

Shanthi Ramnath
Financial Economist, US Department of the Treasury

Part-Time Adjunct Lecturer, UMCP
Ph.D., Economics, University of Michigan-Ann Arbor, 2010
Courses: ECON643, ECON645, ECON672

Patrick Richard
Assistant Professor of Health Economics
Uniformed Services University of the Health Sciences
Part-Time Adjunct Lecturer, UMCP
Ph.D., Health Economics, Johns Hopkins University, 2007
Courses: ECON671

Jonathan Rose
Lead Economics Specialist, Inter-American Development Bank
Part-Time Adjunct Lecturer, UMPC
Ph.D., Economics, University of Iowa, 2001
Courses: ECON676

Cristina Tello-Trillo
Economist, US Bureau of the Census
Part-Time Adjunct Lecturer, UMCP
Ph.D., Economics, Yale, 2015
Courses: ECON645

Razvan Vlaicu
Senior Research Economist, Inter-American Development Bank
Part-Time Adjunct lecturer, UMCP
Ph.D., Economics, Northwestern University, 2006
Courses: ECON644

APPENDIX C: RESOURCES AND EXPENDITURES

Resources Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. Reallocated Funds	$0	$0	$0	$0	$0
2. Semester-Based Revenue (by year)	$487,500	$497,250	$507,195	$517,339	$527,686
a. Semester-based Annual Students	15	15	15	15	15
b. Semester-based Annual Courses	10	10	10	10	10
3. Term-Based Revenue (by year)	$487,500	$497,250	$507,195	$517,339	$527,686
c. Term-based Annual Students	15	15	15	15	15
d. Term-based Annual Courses	10	10	10	10	10
4. Tuition Per Course Rate (assumes 2% increase)	$3,250	$3,315	$3,381	$3,449	$3,518
5. Grants, Contracts, & Other External Sources	$0	$0	$0	$0	$0
6. Other Sources	$0	$0	$0	$0	$0
Total Tuition Revenue	**$975,000**	**$994,500**	**$1,014,390**	**$1,034,678**	**$1,055,371**

Expenditure Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. Faculty (b+c below)	$136,825	$164,418	$169,351	$174,431	$179,664
a. #FTE	6.0	7.0	7.0	7.0	7.0
b. Total Salary	$102,876	$123,623	$127,331	$131,151	$135,086
c. Total Benefits	$33,949	$40,795	$42,019	$43,280	$44,578
2. Admin. Staff (b+c below)	$171,579	$176,727	$182,028	$187,489	$193,114
a. #FTE	1.0	1.0	1.0	1.0	1.0
b. Total Salary	$129,007	$132,877	$136,864	$140,969	$145,199
c. Total Benefits	$42,572	$43,849	$45,165	$46,520	$47,916
3. Total Support Staff (b+c below)	$69,160	$71,235	$73,372	$75,573	$77,840
a. #FTE	2.0	2.0	2.0	2.0	2.0
b. Total Salary	$52,000	$53,560	$55,167	$56,822	$58,526
c. Total Benefits	$17,160	$17,675	$18,205	$18,751	$19,314
4. Graduate Assistants (b+c)	$68,316	$70,365	$72,476	$74,651	$76,890
a. #FTE	2.0	2.0	2.0	2.0	2.0
b. Stipend	$42,000	$43,260	$44,558	$45,895	$47,271
c. Tuition Remission	$26,316	$27,105.48	$27,919	$28,756.20	$29,619
5. Equipment	$3,000	$3,000	$3,000	$3,000	$3,000
6. Library	$5,000	$5,000	$5,000	$5,000	$5,000
7. Off-site Space Rental	$180,000	$185,400	$190,962	$196,691	$202,592
8. Other Expenses: Operational Expenses	$145,750	$148,665	$151,638	$154,671	$157,764
TOTAL (Add 1 - 8)	**$802,435**	**$824,810**	**$847,828**	**$871,506**	**$895,865**

Other expenses include marketing, materials & supplies, travel, IT, and administrative overhead to deliver the program.

Appendix D: Placements of program graduates over the previous three years

3E Company
Allegheny Science & Tech
Berkeley Research Group
Board of Governors of the Federal Reserve
Booz Allen Hamilton
Bulgarian National Bank, Economic Research and Forecasting Directorate
Calibre Systems
Capital One
Cognizant
Constellation, Inc.
Corporation for Enterprise Development
Deloitte
Ernst & Young
Fannie Mae
Federal Energy Regulatory Commission
Freddie Mac
Gartner, Inc.
Geico
Grant Thornton
HDR Engineering
Hetrick & Associates
Insight Policy Research
Institute of International Finance (IIF)
International Monetary Fund
ISS Governance
Keshif
KPMG
Mathematica Policy Research
MCM Capital Partners/ BSI Financial
Members First Credit Union
National Association of Home Builders
National Science Foundation
Northern Virginia Regional Intelligence Center
Office of US Senator Joe Donnelly (D-IN)
Optimal Solutions Group
Plan International
Pricewaterhouse Cooper
Rand Corporation
Regional Economic Studies Institute, Towson University
Resources for the Future
Results for Development
RiskSpan
Roosevelt Institute
SBA Group
Service Employees International Union (SEIU)

Share Our Strength
Summit Consulting
Universal Service Administrative Company (USAC)
US African Development Foundation
US Air Force
US Army
US Bureau of Economic Analysis
US Bureau of Labor Statistics
US Bureau of the Census
US Coast Guard
US Congress
US Department of Agriculture
US Department of Commerce
US Department of Defense
US Department of Energy
US Department of Homeland Security
US Department of State
US Department of the Treasury
US Department of Transportation
US Federal Energy Regulatory Commission
US Federal Housing Finance Agency
US House of Representatives
US International Trade Commission
US Office of the Comptroller of the Currency
Viget
Vital Voices Global Partnership
Washington Business Dynamics
Wells Fargo
Westat
Western Union Business Solutions
Williams Adley & Co.
WSP Parsons Brinckeroff
Zanak'i Gasikara Mifanasoa (NGO)

UNIVERSITY SYSTEM of MARYLAND

BOARD OF REGENTS

SUMMARY OF ITEM FOR ACTION, INFORMATION, OR DISCUSSION

TOPIC: University of Maryland, College Park: Master of Science in Geospatial Information Sciences

COMMITTEE: Education Policy and Student Life

DATE OF COMMITTEE MEETING: Tuesday, March 5, 2019

SUMMARY: Since fall 2008, the University of Maryland, College Park has offered a Master of Professional Studies (MPS) in Geospatial Information Sciences. The intent of this proposal is to create a stand-alone Master of Science (MS) in Geospatial Information Sciences. The curriculum for the proposed MS in Geospatial Information Sciences will be the same as that of the MPS in Geospatial Information Sciences. The degree change to a master's of science allows the Geospatial Information Sciences program to be properly designated as a Science, Technology, Engineering, and Math (STEM) program in the Federal Classification of Instructional Programs (CIP). Giving a proper CIP classification to the Geospatial Information Sciences program will help attract more highly-skilled domestic and international students.

The U.S. Department of Labor has identified geospatial technologies as one of the three most important emerging and evolving fields, along with nanotechnology and biotechnology. GIS is a software application system that has a wide range of application areas such as transportation logistics, network analysis, emergency management, urban planning, environmental research, etc. Demand for well-trained GIS professionals is growing much faster than supply. Trained individuals are needed at multiple levels – from certified entry-level technicians to Ph.D. research scientists. In the Washington DC metropolitan area, there is a high concentration of government agencies and various other organizations that have high demand for skilled GIS professionals.

ALTERNATIVE(S): The Regents may not approve the program or may request further information.

FISCAL IMPACT: No additional funds are required. The program can be supported by the projected tuition and fees revenue.

CHANCELLOR'S RECOMMENDATION: That the Education Policy and Student Life Committee recommend that the Board of Regents approve the proposal from the University of Maryland, College Park to offer the Master of Science in Geospatial Information Sciences.

COMMITTEE RECOMMENDATION:	DATE: March 5, 2019
BOARD ACTION:	DATE:

SUBMITTED BY: Joann A. Boughman 301-445-1992 jboughman@usmd.edu

UNIVERSITY OF MARYLAND
OFFICE OF THE PRESIDENT

Main Administration Building
College Park, Maryland 20742
301.405.5803 TEL 301.314.9560 FAX

February 4, 2019

Chancellor Robert L. Caret
University System of Maryland
3300 Metzerott Road
Adelphi, MD 20783

Dear Chancellor Caret:

I am writing to request approval for a new Master of Science program in Geospatial Information Sciences. The proposal for the new program is attached. I am also submitting this proposal to the Maryland Higher Education Commission for approval.

The proposal was endorsed by the appropriate faculty and administrative committees. I also endorse this proposal and am pleased to submit it for your approval.

Sincerely,

Wallace D. Loh
President

MDC
cc: Antoinette Coleman, Associate Vice Chancellor for Academic Affairs
Mary Ann Rankin, Senior Vice President and Provost
Gregory Ball, Dean, College of Behavioral and Social Sciences

UNIVERSITY SYSTEM OF MARYLAND INSTITUTION PROPOSAL FOR

X	New Instructional Program
	Substantial Expansion/Major Modification
	Cooperative Degree Program
	Within Existing Resources, or
	Requiring New Resources

University of Maryland, College Park
Institution Submitting Proposal

Geospatial Information Sciences
Title of Proposed Program

Master of Science	**Fall 2019**
Award to be Offered	Projected Implementation Date
220601	**45.0702**
Proposed HEGIS Code	Proposed CIP Code
Geographical Sciences	Jianguo (Jack) Ma
Department in which program will be located	Department Contact
301-405-3861	jma3@umd.edu
Contact Phone Number	Contact E-Mail Address
[signature]	2/4/19
Signature of President or Designee	Date

A. Centrality to the University's Mission and Planning Priorities

Description.
For the last decade, the University of Maryland has been offering an iteration of its Master of Professional Studies (MPS) in Geospatial Information Sciences (GIS). The MPS is an approved "umbrella" degree program created in 2005 to allow for nimble changes in graduate level training for working professionals. The purpose of this proposal is to move the existing curriculum out from under the Master of Professional Studies umbrella and to create a standalone Master of Science degree program, allowing it to be classified as a STEM program through a more appropriate federal CIP ("classification of instructional programs") designation. Giving a proper CIP classification to the curriculum will help attract more highly skilled domestic and international students. For domestic students, the STEM designation will enhance their application for scholarships and career improvement. For international students, the extra optional practical training (OPT) term, allowed by the Department of Homeland Security for specific STEM-designated programs, will benefit their future job searches.

GIS is a software application system that has a wide range of application areas such as transportation logistics, network analysis, emergency management, urban planning, environmental research, etc. Demand for well-trained GIS professionals is growing much faster than supply. Trained individuals are needed at multiple levels – from certified entry-level technicians to Ph.D. research scientists. In the Washington DC metropolitan area, there is a high concentration of government agencies and various organizations which have high demand for skilled GIS professionals. Because of its unique location, UMD has a responsibility to provide this kind of quality education and training in Maryland and the greater Washington D.C. metropolitan area.

Relation to Strategic Goals. The GIS curriculum relates to UMD's strategic goals by adding to its STEM program offerings, particularly in an area in which the campus already has significant strength. UMD's department of Geographical Sciences has a research program that is recognized nationally and internationally for its leadership in land remote sensing and allied GIS applications. The department's undergraduate program has more than doubled in size since the introduction of our Geographic Information Systems and Automated Cartography focus in the early 1990's. This professional master's program takes advantage of the department's expertise and facilities.

Funding. Resources for the program are drawn from tuition revenue and are adequate to support program needs.

Institutional Commitment. The program will be administered (as it currently is now) by the Department of Geographical Sciences within the College of Behavioral and Social Sciences. Since the program already exists as Professional Studies iteration, the department has the administrative, instructional, advising, and facilities infrastructure in place to operate the program. In the event that the program is discontinued, the courses will be offered for a reasonable time period so that enrolled students can finish the program. The faculty and administrative infrastructure will still be in place to work with students who have not finished the program.

B. Critical and Compelling Regional or Statewide Need as Identified in the State Plan

Need. The U.S. Department of Labor has identified geospatial technologies as one of the three most important emerging and evolving fields, along with nanotechnology and biotechnology. Introduction of a Master of Science in Geospatial Information Sciences (MS GIS) is part of a larger trend nationally and internationally. Prior to the initial launch of the curriculum in 2008, a market analysis concluded that Geospatial Information Sciences as a field has been experiencing rapid growth. It is used heavily in the federal government, and is growing quickly in state, county, and local government. More importantly, the success of the existing GIS curriculum within the MPS umbrella program has demonstrated market demand. Since 2008, the MPS GIS program has grown from 10 students a year into a current enrollment of about 40-50 students a year.

State Plan. The proposed program aligns with the *Maryland State Plan for Postsecondary Education's* emphasis on success and innovation by connecting students with the innovative technologies needed for careers in geospatial information sciences. Students have access to two 25-seat GIS labs equipped with dual-monitor high-end workstations and connected to remote storage facilities. Students are also able to work from virtual desktops and servers supported by a VMware environment. The labs run a wide variety of commercial and open source software for GIS, remote sensing, statistical analysis, data access, image processing, mathematical analyses, graphics and 3D modeling, and software development. For high-performance computing (HPC), the department's Center for Geospatial Information Science maintains two high-performance Hadoop-based computing clusters that have been purchased for research and student teaching. These clusters are networked to other HPC resources in the Geographical Sciences department, the College of Behavioral and Social Sciences (the "BSWIFT" cluster), and the University of Maryland Institute for Advanced Computer Studies (UMIACS), which operates several clusters. In partnership with the Mid-Atlantic Crossroads (MAX), the department also has high-performance networking access to other HPC sites around the country, as well as nimble access to commercial computing resources (Amazon AWS).

C. Quantifiable and Reliable Evidence and Documentation of Market Supply and Demand in the Region and State

The need for a well-trained and nimble workforce in geospatial information sciences is growing, markedly. The US Bureau of Labor Statistics *Occupational Outlook Handbook* does not list geospatial information scientist as an occupation, but does project that jobs in a related category, cartographers and photogrammetrists, as growing "much faster than average" between 2016-2026.[1] The Bureau lists the state of Maryland as one of the strongest states in the nation for jobs in the geographical sciences, mainly because of the prevalence of federal agencies.[2]

[1] US Bureau of Labor Statistics. (September 6, 2018). Occupational Outlook Handbook: Cartographers and Photogrammetrists. Retrieved from: https://www.bls.gov/ooh/architecture-and-engineering/cartographers-and-photogrammetrists.htm.
[2] US Bureau of Labor Statistics. (March 30, 2018). Occupational Employment and Wages, May 2017 - 19-3092 Geographers. Retrieved from: https://www.bls.gov/oes/current/oes193092.htm#nat.

As the program currently exists as a Professional Studies iteration, its current enrollment provides of evidence of market demand. For the past three fall terms, enrollment has been more than 50 students. The program has high confidence that the enrollment of the proposed MS GIS program will be about 40-50 students per year. The STEM CIP designation will make the program more attractive to international students and it is therefore possible that the program may grow. However, the program does not intend to grow much beyond current enrollments (to no more than 60 students per year), in order to maintain a high quality experience for matriculated students.

D. Reasonableness of Program Duplication

Currently, three universities have similar programs in the State of Maryland. Johns Hopkins offers a Master of Science in GIS (http://advanced.jhu.edu/academics/graduate-degree-programs/geographic-information-systems). UMBC offers a 30-credit Master of Professional Studies and a 15-credit post-baccalaureate certificate in GIS at the Universities at Shady Grove (http://shadygrove.umbc.edu/gis). Salisbury University offers a Geographic Information Systems Management MS (https://www.salisbury.edu/explore-academics/programs/graduate-degree-programs/geo-info-sys-masters/index.aspx).

Our curriculum differs from these others programs in that it is focused on enterprise-level GIS, including topics such as remote sensing, computing, and statistics, with a broader spectrum than a traditional program. The goal of our program is to help students become GIS developers rather than GIS users.

Salisbury's program focuses on GIS management and is fully online. Johns Hopkins University's MS GIS program is also a fully online program. UMBC's GIS program is offered on-site at the Universities at Shady Grove with hybrid and in-person classes. UMD's existing program is face-to-face in College Park, with remote streaming of lecture material that allows participation by those for whom coming to the College Park campus is not convenient. Some laboratory instruction is required, and international students on F-1 visas are required to participate in person in order to comply with regulations by the United States Citizenship and Immigration Services (USCIS). The program is also offered on a 12-week term calendar, which is more attractive to working professionals.

Ultimately, the proposed program will not alter the market demand for these other programs, other than some international students, as our current MPS program has been recruiting and enrolling students since 2008.

E . Relevance to Historically Black Institutions (HBIs)

No such program currently exists at any of Maryland's Historically Black Institutions (HBIs).

F. Relevance to the identity of Historically Black Institutions (HBIs)

UMD has already established itself in the field of Geographical Sciences with its established undergraduate and graduate programs in geographical sciences. Accordingly, the proposed program would not have an impact on the uniqueness or institutional identity of any Maryland HBI.

G. Adequacy of Curriculum Design, Program Modality, and Related Learning Outcomes

Curricular Development. The existing MPS program has been operating successfully since 2008. The program's curriculum, which is not changing, was developed based on geospatial technology trends, demand for GIS professionals, and the growth of teaching and research areas within the department.

Faculty Oversight. The MS GIS program is overseen by the faculty in the department of Geographical Sciences, along with a Program Oversight Committee. Administration and day-to-day management are provided through the University of Maryland Center for Geospatial Information Science (CGIS). Members of the Program Oversight Committee include the Graduate Director (Prof. Laixiang Sun), and the CGIS director (Prof. Kathleen Stewart). The administrative and teaching team is led by program director Dr. Jianguo ("Jack") Ma. The program will also form an "MS GIS Advisory Committee", comprised of about six faculty members, whose role will be to provide term-to-term guidance on the running of the program, strategic advice regarding future opportunities and curricular modifications, and oversight of the annual learning outcomes assessment evaluation.

Educational Objectives and Learning Outcomes. Students who graduate from the **MS GIS** program will:

1. Understand the big picture of geospatial technology as a disciplinary field, including its history, current state, and trends in future developments;
2. Grasp the connections between different geospatial technology components such as GIS, remote sensing, computing, and emerging software and hardware options (e.g. drones and artificial intelligence);
3. Develop a good understanding of how geospatial technology is applied to real-world problems;
4. Develop proficiency in the following specific knowledge and skills:
    a. collection, processing, analysis, modeling and visualization of spatial data;
    b. interpretation, analysis, design and implementation of spatial databases;
    c. processing and analysis of digital images;
    d. development of mobile GIS and native apps across mobile platforms (Android, iOS, etc.);
    e. interpretation and design of clearly structured programs using Python;
    f. development of client-side and server-side Web applications for non-GIS applications
    g. creation, analysis, and dissemination of GIS data and services via the Web using various technologies;
    h. spatial analysis, including enterprise GIS, spatial SQL, parallel processing, and display of GIS results on Internet, through open use of open-source software;
    i. development of applications of experimental semivariograms, semivariogram models,

kriging, cross validation, spatial sampling, and spatiotemporal pattern analysis;

j. analysis of big data with high performance computing, especially spatial data in large volume and high velocity;

5. Develop analytic thinking and real-world problem solving for future success in the workforce. Skills include but are not limited to interpersonal communications and teamwork, creative and critical thinking, occupational planning and organizing, problem-solving and decision making;
6. Design and develop a comprehensive and in-depth GIS project; and
7. Comprehend and apply ethical issues in geospatial practice and research, including ethical standards to protect data privacy, security, and copyright, among others.

See Appendix A for more information on learning outcomes assessment.

Institutional assessment and documentation of learning outcomes. Student learning outcomes assessment in graduate programs is directed by the Graduate Outcomes Assessment Committee. Established in 2011, this committee is comprised of representatives from each college and school. Graduate Outcomes Assessment reports for doctoral and master's programs are due every other year, with approximately half of the campus graduate programs reporting each year.

Course requirements. The curriculum will consist of 31 credits organized into the following categories:

- 22 credits of core courses
- 9 credits of elective courses

Geospatial Information Sciences Core Courses (22 credits)		
Course	Title	Credits
GEOG651	Spatial Statistics	3
GEOG652	Digital Image Processing and Analysis	3
GEOG653	Spatial Analysis	3
GEOG655	Spatial Database System	3
GEOG656	Programming and Scripting for GIS	3
GEOG657	Web Programing	3
GEOG795	Professional Practices Seminar	1
GEOG797	Professional Project (Capstone)	3

Geospatial Information Sciences Elective Courses (9 credits)		
Course	Title	Credits
GEOG650	Mobile GIS	3
GEOG654	GIS and Spatial Modeling	3
GEOG660	Advanced Remote Sensing Using Lidar	3
GEOG661	Fundamentals of Geospatial Intelligence	3
GEOG663	Big Data Analytics	3
GEOG670	Open Source GIS	3

GEOG677	Internet GIS	3
GEOG796	GIS Project Management	3

See Appendix B for course descriptions.

General Education. Not applicable as this is as a master's program.

Accreditation or Certification Requirements. There are no specialized accreditation or certification requirements for this program.

Other Institutions or Organizations. The department will not contract with another institution or non-collegiate organization for this program.

Student Support. As the program already exists as an iteration of the professional studies program, student support mechanisms are already in place. The Center for Geospatial Information Science provides a comprehensive and detailed webpage of resources for understanding curriculum, advising, technological needs (including the learning management system), relevant Graduate School policies, financial aid and cost and payment information. See https://geospatial.umd.edu/education/resources for more details.

Marketing and Admissions Information. The professional studies program iteration is clearly and accurately described in the university website: https://geog.umd.edu/graduate/mpsgis-0. This website will be updated for the Master of Science program upon approval.

H. Adequacy of Articulation

As a graduate program, articulation is not applicable.

I. Adequacy of Faculty Resources

Program faculty. As the program is already offered as an iteration of the professional studies program, faculty resources are already in place. The current MPS GIS program has three full-time lecturers who are dedicated to teaching most of the classes offered in the curriculum. Part-time lecturers are used for some classes, especially during summer and winter terms.

See faculty biographies in Appendix C for those currently expected to teach in the program.

Faculty training. The Teaching and Learning Transformation Center at the University of Maryland inspires and supports effective, engaging, efficient, and equitable teaching innovations among the university's instructors and assistants. This team provides faculty with training, resources, professional development activities, and individualized consultation to transform their classrooms and careers.

For the learning management system, faculty teaching in this program will have access to teacher development opportunities available across campus, including those offered as part of the Teaching

and Learning Transformation Center. For online elements of the coursework, instructors will work with the learning design specialists on campus to incorporate best practices when teaching in the online environment. Since all courses are delivered synchronously, the learning outcomes, assessments, and expected student participation are the same whether students are participating remotely or are physically present in the classroom. The existing MPS GIS Program has been using ELMS and video conferencing technologies to provide dynamic and interactive online teaching component since 2009. Program evaluation is the same for distance delivery and face-to-face delivery.

J. Adequacy of Library Resources

The University of Maryland Libraries has conducted an assessment of library resources required for this program. The assessment concluded that the University Libraries are able to meet, with its current resources, the curricular and research needs of the program.

K. Adequacy of Physical Facilities, Infrastructure, and Instructional Resources

The program exists already as an iteration of the professional studies program, and currently has facilities, infrastructure, and instructional resources in place. The Center for Geospatial Information Science has access to two 25-seat GIS labs with specialized software and hardware that allows students to engage in GIS training. The labs run a wide variety of commercial and open source software for GIS, remote sensing, statistical analysis, data access, image processing, mathematical analyses, graphics and 3D modeling, and software development. As noted in Section B of the proposal, the program also has access to multiple high-performance computing resources.

For online components of the program, UMD maintains an Enterprise Learning Management System (ELMS) for coursework. ELMS is a Web-based platform for sharing course content, tracking assignments and grades, and enabling virtual collaboration and interaction. The Geospatial Information Sciences program will use ELMS for all its courses. The Department of Geographical Sciences also maintains a Cisco WebEx Online course delivery platform, by which lectures and discussions can be streamed virtually. Faculty, staff, and students can communicate in real-time using chat, voice (microphone and speakers), and video (webcam) with WebEx. WebEx allows for the ability to display presentations, annotate overtop slides, perform live editing of documents and even conduct a poll within the software. The Department maintains two dedicated servers and shared storage for server-side delivery of GIS software. All students have access to the UMD email system.

L. Adequacy of Financial Resources

Tables 1 and 2 contain the details of resources and expenditures. Tuition revenue, with some modest investment from the Center for Geospatial Information Science, is sufficient to cover the cost of offering the program.

M. Adequacy of Program Evaluation

Formal program review is carried out according to the University of Maryland's policy for Periodic Review of Academic Units, which includes a review of the academic programs offered by, and the research and administration of, the academic unit (http://www.president.umd.edu/policies/2014-i-600a.html). Program Review is also monitored following the guidelines of the campus-wide cycle of Learning Outcomes Assessment (https://www.irpa.umd.edu/Assessment/LOA.html). Faculty within the department are reviewed according to the University's Policy on Periodic Evaluation of Faculty Performance (http://www.president.umd.edu/policies/2014-ii-120a.html). Since 2005, the University has used an online course evaluation instrument that standardizes course evaluations across campus. The course evaluation has standard, university-wide questions and also allows for supplemental, specialized questions from the academic unit offering the course.

N. Consistency with Minority Student Achievement goals

The current MPS GIS program has been very successful in recruiting and retaining a diverse student body since 2008. This new MS GIS program will draw on the previous experiences and with continued exploration of new opportunities for further improvement. The program recruits in person at professional conferences and by visiting undergraduate courses. The program also advertises online. Since many students are working professionals, the program networks with governmental agencies and private companies. The program also works with alumni to help recruit for the program. Retention efforts has focused on developing experiential learning opportunities for students as well as ensuring that the curriculum is up-to-date given the evolution of this technical field. UMD has stated goals for recruiting and graduating a diverse population of graduate students in its strategic plan for diversity. The Graduate School works with programs on recruiting and graduating diverse populations. Furthermore, "the provost and Graduate School will consider the success of its programs in recruiting and graduating a diverse population of graduate students when allocating institutional financial support to programs, departments, and colleges and schools."[3]

O. Relationship to Low Productivity Programs Identified by the Commission

N/A

P. Adequacy of Distance Education Programs

N/A

[3] University of Maryland, College Park. (September 16, 2010). *Transforming Maryland: Expectations for Diversity and Inclusion.* (p. 20). Retrieved January 28, 2019 from: http://www.provost.umd.edu/Documents/Strategic_Plan_for_Diversity.pdf.

Appendix A: Learning Outcomes Assessment

The learning outcomes of students graduated from the MS GIS program include:

1. Can see the big picture of geospatial technology as a discipline field with a good understanding of its history, current state, and future development trend.
2. Grasp of the connections among different geospatial technology components such as GIS, remote sensing, computing, and emerging software and hardware options, e.g. drones and artificial intelligence.
3. A good understanding of how geospatial technology is applied in solving real-world problems.
4. Proficient in the following specific knowledge and skills:
    a. Collect, process, analyze, model and visualize spatial data
    b. Interpret, analyze, design and implement spatial databases
    c. Process and analyze digital images
    d. Develop mobile GIS and native apps across mobile platforms (Android, iOS, etc.)
    e. Interpret and design clearly structured programs using Python
    f. Develop client-side and server-side Web applications for non-GIS applications
    g. Create, analyze, and disseminate GIS data and services via the Web using [various technologies]
    h. Conduct spatial analysis, including enterprise GIS, spatial SQL, parallel processing, and display of GIS results on Internet, through open use of open-source software
    i. Develop applications of experimental semivariograms, semivariogram models, kriging, cross validation, spatial sampling, and spatiotemporal pattern analysis
    j. Analyze big data with high performance computing, especially spatial data in big volume and velocity
5. Training of analytic thinking and real-world problem solving for future success in the workforce. Skills include but are not limited to interpersonal communications and teamwork, creative and critical thinking, occupational planning and organizing, problem-solving and decision making.
6. Design and develop a comprehensive and in-depth GIS project.
7. Comprehend and apply ethical issues in geospatial practice and research, including ethical standards to protect data privacy, security, and copyright, among others

To help students achieve these outcomes, the MS GIS program will make great efforts in the following three areas:

1. Curriculum
    a. The curriculum must be cutting-edge and provide the most updated information to the students. The MS GIS course materials will be frequently upgraded to keep up with the advancement of geospatial technology in terms of both software and hardware.
    b. The curriculum must be more than just GIS and should be broad enough to encompass topics such as remote sensing, and increasingly computing. We will try to add new topics such as data science and drones.
    c. More elective courses will be developed and offered in the MS GIS Program. This will help meet specific interest or needs of students, which in turn will improve learning satisfaction.

2. Teaching format
    a. We will provide teaching in both on-site and online format. This will ensure the students to attend the real lectures in real time no matter which option they will choose. This dynamic and interactive teaching environment will definitely improve their learning experiences and effectiveness.
    b. All the lectures and lab session are video archived. This will allow students to review these materials repeatedly when needed until they fully understand the course materials. These video archives can also be saved for later reference. Therefore, this teaching technology can help improve students' learning and also retain the knowledge.
3. Resources for teaching and learning
    a. We will help students improve their learning experiences by providing a variety of resources. Besides, instructors, Teaching Assistants are available to help students in each class.
    b. Instructors are encouraged to attend academic conferences and also conduct research. This will help instructors to gain the updated knowledge and skills in the field, which in turn will benefit the students during the teaching process.
    c. Beyond the MS GIS Program, students will have access to all the teaching and research resources in the Department of Geographical Sciences. We encourage MS GIS students to participate in faculty's research projects whenever possible.

To assess the learning outcomes, we will evaluate students in a variety of ways:

1. Capstone project
    - The capstone project is one of the main culminating course experiences for the MS GIS program. Each capstone project will be evaluated in a dedicated review session and evidence of learning outcomes as they present in the projects will be assessed.
2. Exit interview
    - An exit interview will be conducted annually with a random sample of graduates (80%) to assess their overall satisfaction with the Program. Some of the interview questions can be designed specifically to help evaluate students' learning effectiveness and outcomes.
3. In-class observation
    - This assessment will be conducted through informal observations by instructors in the MS GIS program, as well as by faculty in the Department of Geographical Sciences. Unstructured (quick chats and check-ins) and structured (survey questions) data will be collected to support these observations.
4. Course Evaluation

The course evaluation report for each MS GIS class will be carefully analyzed to identify issues and also evaluate students' satisfaction to teaching and learning. Very often in their comments, students will describe their learning outcomes.

Appendix B: Course Descriptions

Core Courses

GEOG651 Spatial Statistics (3 Credits)
This course is about quantitative analysis of spatial data. It is intended to provide a broad survey of various spatial statistic methods. The course is geared towards helping students: (1) develop an understanding of the important theoretical concepts in spatial data analysis; and (2) gain practical experience in the application of spatial statistics to a variety of social and environmental problems using the advanced statistical software. This course covers five broad topical areas: (1) point pattern analysis; (2) area data analysis; (3) continuous data analysis; (4) spatial sampling; and (5) multivariate spatial and temporal analysis.

GEOG652 Digital Image Processing and Analysis (3 Credits)
Digital image processing and analysis applied to satellite and aircraft land remote sensing data. Consideration is given to preprocessing steps including calibration and georegistration. Analysis methods include digital image exploration, feature extraction thematic classification, change detection, and biophysical characterization. Example applications will be reviewed.

GEOG653 Spatial Analysis (3 Credits)
Methods of spatial analysis including measuring aspects of geometric features and identifying spatial patterns of geospatial objects that are represented as point, line, network, areal data, and 3-D surfaces.

GEOG655 Spatial Database (3 Credits)
This course is designed to help students understand, analyze, design, and implement spatial databases. While the basic concepts and theories of database will be introduced, the focus of this course will be on providing students with hands-on experiences to practice the technical skills used in spatial database design and implementation. SQL, Oracle, and ArcSDE are the key topics.

GEOG656 Programming and Scripting for GIS (3 Credits)
An introduction to programming and scripting for intermediate GIS users. The fundamental concepts of computer programming will be introduced within the Geoprocessing framework in ArcGIS primarily using Python. Basic concepts of object-oriented programming and scripting will be presented. Students will develop skills in programming techniques to explore, manipulate and model spatial data using the Geoprocessor methods.

GEOG657 Web Programming (3 Credits)
Intermediate course designed to teach students the techniques for Web development, particularly creating dynamic and data-driven Web applications. Introduces a high-level, object-oriented programming language such as VB.Net and the designing, coding, debugging, testing, and documenting for the development of Web-based applications. Other popular Web development tools such as DHTML, CSS and PHP are also covered.

GEOG795 Professional Practices Seminar (1 Credit)
Development and preparation of a resume, selecting and helping reference writers, conducting successful interviews, negotiating an employment package, giving professional presentations, proposal preparation,

writing reports, codes of ethics and responsibilities. Presentations from practitioners in GIS field. Basic project management skills and strategies in preparation for professional project.

GEOG797 Professional Project (3 Credits)
Data and materials can originate from an internship (internal or external) or from relevant work experience with current employer. Under direction of faculty advisor, students will prepare a project report containing explanation of the requirements for the work, technical account of the activities undertaken, including literature review, description of methods and approaches taken, a critical discussion of results, along with conclusions and recommendations developed from the project. Final project will consist of a full-fledged GIS application that is up and running and can be tested, providing potential employers with a portfolio demonstrating student's ability to manage and develop a GIS application in real world situations.

Elective Courses

GEOG650 Mobile GIS (3 Credits)
This course covers how to create, test, and publish mobile GIS applications that work across multiple platforms (Android, iOS, and Black Berry Tablet OS) and adapt to a smartphone or tablet display.

GEOG654 GIS and Spatial Modeling (3 Credits)
Provide foundations and understanding on various issues related to modeling and simulation in GIS context. It will addresses the concepts, tools, and techniques of GIS modeling, and presents modeling concepts and theory as well as provides opportunities for hands-on model design, construction, and application. The focus will be on raster-based modeling. This course is also application-orientated, particularly in these fields such as terrain modeling, LULC modeling, hydrological modeling, suitability modeling, etc.

GEOG660 Advanced Remote Sensing using Lidar (3 Credits)
Lidar, also known as laser scanning, is an active remote sensing tool that can produce high-resolution point clouds. Lidar is being applied to problems such as terrain modeling, biomass estimation, change detection, feature extraction, and measuring tree canopy. Topics covered are fundamentals of lidar, current developments in lidar technology, and different applications where lidar is being used. Students will get hands-on learning about lidar data management, processing, and analysis.

GEOG661 Fundamentals of GEOINT (3 Credits)
Geospatial Intelligence (GEOINT) is the collection, analysis, visualization and dissemination of geospatial information to support decision-making. This course introduces the fundamental knowledge required to become a successful GEOINT practitioner, including the history of the GEOINT discipline, the intelligence applications of remote sensing and Geographic Information Systems (GIS) technologies, and how GEOINT products are used to support national security and humanitarian missions. Upon completion of this course you will understand the roles that technology, policy, doctrine, government, and industry play in shaping the Geospatial Intelligence discipline, and develop the technical knowledge and domain expertise to create basic GEOINT products that provide context for decision makers.

GEOG663 Big Data Analytics (3 Credits)

Designed to introduce statistical analysis over big data sets (and tackling big data problems), primarily in geography and spatial sciences, but with broader appeal throughout the socio-behavioral sciences. Students will be introduced to a range of methods that can be applied to the exploration, modeling, and visualization of big quantitative data. This course explores data fusion, statistical analysis, and data-mining for geospatial and non-geospatial data in structured and unstructured form, with an emphasis on large silos of data across diverse sources and assumptions. Topics will include open sourcing, metadata schemes, data standards and models, data-access, data-mining, clustering methods, classifiers, data reduction, machine learning, filtering schemes, real-time and streaming data, archiving and preservation, and handling uncertainty.

GEOG670 Open Source GIS (3 Credits)
An exploration of techniques for using Free and Open Source Software for GIS (FOSS4g) from conception to final presentation of results. Advanced concepts and techniques including enterprise GIS, spatial SQL, parallel processing, and displaying the results of GIS analysis over the Internet will also be covered.

GEOG677 Internet GIS (3 Credits)
Online course delivers information on the use of GIS applications on the Internet. Covers hardware/software structure of the Internet, the means for communication between Internet-connected devices, applications that provide GIS program and data, and performance and security concerns.

GEOG796 GIS Project Management (3 Credits)
Project management methodology is covered, emphasizing implementing and integrating GIS into broader projects. Topics include project initiation, planning, scope, scheduling, budgeting and risk management.

Appendix C: Faculty

Dr. Kathleen Stewart, Full-Time, Tenure Track
Kathleen Stewart is Director of the Center for Geospatial Information Science and works in the area of geographic information science with a particular focus on geospatial dynamics. This includes topics such as moving objects research (e.g., space-time trajectories, space-time scheduling) and event modeling for dynamic GIS. She is interested in mobility, spatial accessibility, big geospatial data, and currently investigates movement and mobility for a number of different application domains, for example, health and transportation. She is also interested in modeling geospatial semantics including geospatial ontologies and their role for geographic information system design, and spatiotemporal information retrieval. At the University of Maryland, Dr. Stewart is a member of the Program in Oncology at the University of Maryland Marlene and Stewart Greenebaum Comprehensive Cancer Center and also collaborates with researchers at the Institute for Global Health, the Center for Substance Abuse Research, the National Transportation Center, the School of Public Health, and among others. Her research is currently supported in part by grants from the National Institutes of Health, NASA, and the Federal Highway Administration, among other organizations, and she has also received support from IARPA, NGA and NSA. Dr. Stewart serves as a member of the Mapping Science Committee of the National Academies of Sciences, Engineering and Medicine and the Board of Directors for the University Consortium of Geographic Information Science. She is a member of the steering committee for the Maryland Transportation Institute. She also serves as a member of the editorial boards for The International Journal of Geographical Information Science (IJGIS), Computers, Environment, and Urban Systems, Transactions in GIS, Geographical Analysis, and the open-access Journal of Spatial Information Science (JOSIS).

Dr. Jianguo Ma, Full-Time, Professional Track
Dr. Ma is the Director and a Lecturer in the Department of Geographical Sciences at the University of Maryland, College Park. His teaching and research interest are focused on the application of Spatial Analysis, GIS modeling and Web GIS in the field of renewable energy and sustainable development as well as marketing analysis. His educational background includes PhD in Biological and Environmental Engineering from Cornell University (2005) and MS (2003) from Cornell University, MA from Peking University, BS in Geological Engineering from Beijing University of Science and Technology.
The courses that Dr. Ma teaches in the MS GIS program:
GEOG653 (Spatial Analysis), GEOG654 (GIS and Spatial Modeling), GEOG677 (Internet GIS), GEOG795 (GIS Professional Seminars), GEOG797 (Professional Project)

Dr. Jonathan Resop, Full-Time, Professional Track
Dr. Resop is a Senior Lecturer in the Department of Geographical Sciences at the University of Maryland. Jonathan earned his Ph.D. at Virginia Tech in Biological Systems Engineering. During his time at Virginia Tech, he worked on multiple projects related to spatial modeling and remote sensing, in particular problems that involve agricultural and environmental systems. His dissertation involved applying ground-based lidar to various ecological applications. After completing his Ph.D. he worked as a post-doc for the USDA-ARS in Beltsville in the Crop Systems and Global Change Lab, doing research related to simulating the potential production capacity of crops within regional food systems using a

geospatial crop model. Jonathan received his undergraduate degrees at the University of Maryland, College Park in Biological Resources Engineering and Computer Science.
The courses that Dr. Resop teaches in the MS GIS program:
GEOG654 (GIS and Spatial Modeling), GEOG656 (Programming and Scripting for GIS), GEOG660 (Advanced Remote Sensing with Lidar), GEOG797 (Capstone Project)

Dr. Eunjung Lim, Full-Time, Professional Track
Dr. Lim earned a Ph.D. degree in Geography (GIS specialty) from the State University of New York at Buffalo. Her specialty is geographic information sciences. In the realm of GIS, she has developed special interest and knowledge in GIS modeling, programming, network analysis, and spatial statistics. She has about 12 years of experience developing software using Java, C, C++, Visual Basic and relational databases.
The courses that Dr. Lim teaches in the MS GIS program:
GEOG650 (Mobile GIS), GEOG651 (Spatial Statistics), GEOG656 (Programming and Scripting for GIS), GEOG657 (Web Programming), GEOG797 (Capstone Project)

Dr. Naijun Zhou, Full-Time, Professional Track
Dr. Zhou is a Senior Lecturer in the Department of Geographical Sciences at the University of Maryland. His teaching and research are focused on Web GIS, Databases, Geospatial semantics and ontology. His educational background includes BS in Photogrammetry and Remote Sensing, MS in GIS, Remote Sensing & Cartography, MS in Computer Science, and PhD in GIScience from the University of Wisconsin.
The courses that Dr. Zhou teaches in the MS GIS program:
GEOG652 (Digital Image Processing and Analysis), GEOG655 (Spatial Databases)

Table 1: Resources

Resources Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1.Reallocated Funds	$0	$0	$0	$0	$0
2. Tuition/Fee Revenue (c+g below)	$902,720	$920,774	$939,190	$957,974	$977,133
a. #FT Students	0	0	0	0	0
b. Annual Tuition/Fee Rate	$17,208	$17,724	$18,256	$18,804	$19,368
c. Annual FT Revenue (a x b)	$0	$0	$0	$0	$0
d. # PT Students	40	40	40	40	40
e. Credit Hour Rate	$728	$743	$757	$773	$788
f. Annual Credit Hours	31	31	31	31	31
g. Total Part Time Revenue (d x e x f)	$902,720	$920,774	$939,190	$957,974	$977,133
3. Grants, Contracts, & Other External Sources	$0	$0	$0	$0	$0
4. Other Sources	$0	$0	$0	$0	$0
TOTAL (Add 1 - 4)	**$902,720**	**$920,774**	**$939,190**	**$957,974**	**$977,133**

Student enrollments are a mix of full-time and part-time, but for ease of computation, enrollments are identified as part time and tuition revenue is computed on a per credit-hour basis.

able 2: Estimated expenditures

Expenditure Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. Faculty (b+c below)	$339,150	$349,325	$359,804	$370,598	$381,716
a. #FTE	3.0	3.0	3.0	3.0	3.0
b. Total Salary	$255,000	$262,650	$270,530	$278,645	$287,005
c. Total Benefits	$84,150	$86,675	$89,275	$91,953	$94,712
2. Admin. Staff (b+c below)	$133,000	$136,990	$141,100	$145,333	$149,693
a. #FTE	1.0	1.0	1.0	1.0	1.0
b. Total Salary	$100,000	$103,000	$106,090	$109,273	$112,551
c. Total Benefits	$33,000	$33,990	$35,010	$36,060	$37,142
3. Total Support Staff (b+c below)	$89,110	$91,783	$94,537	$97,373	$100,294
a. #FTE	1.0	1.0	1.0	1.0	1.0
b. Total Salary	$67,000	$69,010	$71,080	$73,213	$75,409
c. Total Benefits	$22,110	$22,773	$23,456	$24,160	$24,885
4. Graduate Assistants (b+c)	$148,832	$153,297	$157,896	$162,633	$167,512
a. #FTE	4.0	4.0	4.0	4.0	4.0
b. Stipend	$80,000	$82,400	$84,872	$87,418	$90,041
c. Tuition Remission	$68,832	$70,897	$73,024	$75,215	$77,471
5. Equipment	$10,000	$10,300	$10,000	$10,000	$10,000
6. Library	$0	$0	$0	$0	$0
7. New or Renovated Space	$0	$0	$0	$0	$0
8. Other Expenses: Operational Expenses	$152,408	$155,116	$157,878	$160,696	$163,570
TOTAL (Add 1 - 8)	**$872,500**	**$896,811**	**$921,215**	**$946,633**	**$972,785**

The Program director, who also teaches in the program, is included as Administrative Staff. Support staff includes a program coordinator. Equipment includes periodic turnover of computing equipment used in the instructional laboratories. Other expenses include marketing, materials and supplies, and centrally provided administrative expenses computed at 15% of tuition revenue.

BOARD OF REGENTS

UNIVERSITY SYSTEM of MARYLAND

SUMMARY OF ITEM FOR ACTION, INFORMATION, OR DISCUSSION

TOPIC: University of Maryland, College Park: Master of Science in Geospatial Intelligence

COMMITTEE: Education Policy and Student Life

DATE OF COMMITTEE MEETING: Tuesday, March 5, 2019

SUMMARY: Since fall 2017, the University of Maryland, College Park has offered a Master of Professional Studies (MPS) in Geospatial Intelligence. The intent of this proposal is to create a stand-alone Master of Science (MS) in Geospatial Intelligence. The curriculum for the proposed MS in Geospatial Intelligence will be the same as that of the MPS in Geospatial Intelligence. The degree change to a master's of science allows the Geospatial Information Sciences program to be properly designated as a Science, Technology, Engineering, and Math (STEM) program in the Federal Classification of Instructional Programs (CIP). The proper CIP classification for the Geospatial Intelligence program will increase its market visibility to students.

The program will provide workforce-focused training in cutting-edge topics in geospatial intelligence, geographic information science, remote sensing, and data science in the big data era. The MS in Geospatial Intelligence will provide the skills and expertise to graduates to lead new initiatives in the rapidly-shifting landscape of defense and security applications. The field of geospatial intelligence was initially associated with national security, but now there is a need in a variety of areas, including machine intelligence, business intelligence, criminology, government, and emergency management. The curriculum in Geospatial Intelligence is distinct from Geospatial Information Sciences in that it has a stronger focus on remote sensing, information management, information security, and data analytics.

ALTERNATIVE(S): The Regents may not approve the program or may request further information.

FISCAL IMPACT: No additional funds are required. The program can be supported by the projected tuition and fees revenue.

CHANCELLOR'S RECOMMENDATION: That the Education Policy and Student Life Committee recommend that the Board of Regents approve the proposal from the University of Maryland, College Park to offer the Master of Science in Geospatial Intelligence.

COMMITTEE RECOMMENDATION:		DATE: March 5, 2019
BOARD ACTION:		DATE:
SUBMITTED BY: Joann A. Boughman	301-445-1992	jboughman@usmd.edu

UNIVERSITY OF MARYLAND
OFFICE OF THE PRESIDENT

Main Administration Building
College Park, Maryland 20742
301.405.5803 TEL 301.314.9560 FAX

February 4, 2019

Chancellor Robert L. Caret
University System of Maryland
3300 Metzerott Road
Adelphi, MD 20783

Dear Chancellor Caret:

I am writing to request approval for a new Master of Science program in Geospatial Intelligence. The proposal for the new program is attached. I am also submitting this proposal to the Maryland Higher Education Commission for approval.

The proposal was endorsed by the appropriate faculty and administrative committees. I also endorse this proposal and am pleased to submit it for your approval.

Sincerely,

Wallace D. Loh
President

MDC
cc: Antoinette Coleman, Associate Vice Chancellor for Academic Affairs
Mary Ann Rankin, Senior Vice President and Provost
Gregory Ball, Dean, College of Behavioral and Social Sciences

UNIVERSITY SYSTEM OF MARYLAND INSTITUTION PROPOSAL FOR

X	New Instructional Program
	Substantial Expansion/Major Modification
	Cooperative Degree Program
	Within Existing Resources, or
	Requiring New Resources

University of Maryland, College Park
Institution Submitting Proposal

Geospatial Intelligence
Title of Proposed Program

Master of Science	**Fall 2019**
Award to be Offered	Projected Implementation Date
220602	**29.0203**
Proposed HEGIS Code	Proposed CIP Code
Geographical Sciences	Ruibo Han
Department in which program will be located	Department Contact
301-314-1343	ruibo@umd.edu
Contact Phone Number	Contact E-Mail Address
2/4/19	
Signature of President or Designee	Date

A. Centrality to the University's Mission and Planning Priorities

Description. The Master of Science (MS) in Geospatial Intelligence at the University of Maryland, College Park (UMD) will provide workforce-focused training in cutting-edge topics in geospatial intelligence, geographic information science, remote sensing, and data science in the big data era. The program will provide skills and expertise to graduates to lead new initiatives in the rapidly shifting landscape of defense and security applications. The field of geospatial intelligence was initially associated with national security, but now there is a need in a variety of areas, including machine intelligence, business intelligence, criminology, government, and emergency management. The 30-credit master's program consists of 15 credits of core courses and 15 credits from a list of elective courses.

The program exists already as an iteration of UMD's Master of Professional Studies program. The Master of Professional Studies is an approved "umbrella" degree program created in 2005 to allow for nimble changes in graduate level training for working professionals. The proposed stand-alone MS program will succeed the current Professional Studies program iteration. A limitation of offering the program as a Professional Studies iteration is that all Professional Studies programs must use the same generic federal Classification of Instructional Programs (CIP) code rather than a CIP code that accurately describes the program content. Searches that use CIP codes to find program offerings do not result in the discipline-specific iteration, which reduces market visibility. Moreover, some CIP codes are designated as "STEM" eligible by the Department of Homeland Security, and international students with F1 visas who graduate from STEM designated programs may continue to work in the United States for two years longer than students in non-STEM designated programs. The generic CIP code for Professional Studies programs does not qualify as STEM-designated, even though the academic content of the Geospatial Intelligence program is STEM-related. The proposed MS program will have a STEM CIP code. Based on the number of inquiries from international students, the program expects to attract a significant number of international students, and a 24-month post-completion optional practical training (OPT) term will make the program more competitive for international applicants.

Relation to Strategic Goals. As the flagship campus of the University System of Maryland, and the original 1862 land-grant institution in the State, UMD has a mission to provide excellent teaching, research, and service to nourish a climate of intellectual growth and provide outstanding instruction in a broad range of academic disciplines and interdisciplinary fields. UMD has as a primary goal to provide knowledge-based programs and services that are responsive to the needs of the citizens across the state and throughout the nation. UMD states the following graduate education objective in its *Strategic Plan*: "The University will maintain excellent professional graduate programs that are nationally recognized for their contributions to the practice of the professions, for their forward-looking curricula, and for their spirit of innovation and creativity."[1] UMD established the Geospatial Intelligence program as an iteration of the Master of Professional Studies in 2016 in order to expand

[1] University of Maryland, College Park. (May 21, 2008). *Transforming Maryland: Higher Expectations. The Strategic Plan for the University of Maryland.* (p. 15). Retrieved January 18, 2019 from: http://www.provost.umd.edu/SP07/StrategicPlanFinal.pdf.

professional graduate opportunities in emerging fields. The Geospatial Intelligence program addresses the immediate and growing need to train a workforce for the rapidly expanding local geospatial intelligence industry in Maryland and in particular the greater Washington, D.C. metropolitan area.

Funding. The program currently exists as a Master of Professional Studies iteration and no changes are being made to the program other than the conversion to a stand-alone MS program. Consequently, the resources that currently exist for the program are sufficient. The program derives its funding through tuition revenue.

Institutional Commitment. The program will be administered (as it currently is now) by the Department of Geographical Sciences within the College of Behavioral and Social Sciences. Since the program already exists as Professional Studies iteration, the department has the administrative, instructional, advising, and facilities infrastructure in place to operate the program. In the event that the program is discontinued, the courses will be offered for a reasonable time period so that enrolled students can finish the program. The faculty and administrative infrastructure will still be in place to work with students who have not finished the program.

B. Critical and Compelling Regional or Statewide Need as Identified in the State Plan

Need. The growing field of geospatial intelligence was originally associated with national security—the National Geospatial-Intelligence Agency (NGA) is tasked with visualizing, analyzing, and assessing national security through collection and interpretation of geospatial data. These data now come from an ever-growing array of sources, including other intelligence agencies; grounded, airborne, and orbital sensor platforms; evolving silos of big data generated by Internet and Communications Technologies (ICTs); and actively and passively volunteered geographic information that populations and devices cast during their everyday actions and interactions. Geospatial intelligence has, however, begun to grow beyond its original security focus, and the field now encompasses a variety of arenas in which geospatial intelligence plays a role. In machine intelligence, geospatial intelligence is a core component of navigation systems for vehicles and robots, as well as computer vision schemes. In business intelligence, it forms the basis for geodemographics, customer management systems, marketing analytics, location-allocation and site selection support systems, and logistics. In criminology, geospatial intelligence is widely employed in managing public security and investigating crime. In government and public policy, geospatial intelligence is significant in resource allocation and assessment of service delivery. In natural hazards and emergency response, it provides key data management and analysis tools for monitoring, assessing, and mitigating capabilities in decision making, method preparedness, and early warning system. In engineering and computing industries, it forms an important component of systems engineering, particularly in the emerging area of cyber-physical systems and cyberspace systems using commercial and open-source platforms. In the earth sciences, geospatial intelligence is used to provide base mapping, geo-referencing, and data fusion for a variety of data products and sensor systems.

Our local surroundings play host to the center of influence for the geospatial intelligence industry in the United States. The National Geospatial-Intelligence Agency employs 8,500 people at the third largest federal building in the D.C. region at nearby Springfield, VA. The NASA Goddard Space Flight

Center in nearby Greenbelt, and the United State Geological Survey in nearby Reston, VA serve as the nexus for the nation's earth science geospatial intelligence. The U.S. Census Bureau in nearby Suitland, MD is tasked with a decennial nationwide data collection exercise that mobilizes a huge workforce to perform geospatial intelligence gathering year-round.

State Plan. The proposed program in Geospatial Intelligence aligns with the *Maryland State Plan for Postsecondary Education's* emphasis on success and innovation by connecting students with the innovative technologies needed for careers in geospatial intelligence. Students have access to two 25-seat GIS labs equipped with dual-monitor high-end workstations and connected to remote storage facilities. Students are also able to work from virtual desktops and servers supported by a VMware environment. The labs run a wide variety of commercial and open source software for GIS, remote sensing, statistical analysis, data access, image processing, mathematical analyses, graphics and 3D modeling, and software development. The department's Center for Geospatial Information Science maintains a set of location-aware devices for teaching mobile GIS. These include (1) tablets equipped with positioning and motion sensors that students can learn how to program and extract data from, (2) virtual reality media for immersive exploration of models and data, and (3) sensing devices for desktop and console computing that can generate real-time positioning, motion, and gesture captures.

C. Quantifiable and Reliable Evidence and Documentation of Market Supply and Demand in the Region and State

The field of geospatial intelligence has recently and suddenly ballooned and major technology companies (Google, Apple, Facebook, Über, for example) have been scrambling to put together teams to get up to speed. These technology-based companies join already well-established geospatial intelligence divisions in major government contract companies in and around the Washington metropolitan area, such as BAE Systems, Lockheed Martin, Northrup-Grumman, IDS, and Leidos, as well as most banks and insurance companies, all of which have geospatial intelligence divisions. Entirely new companies are beginning to form around the topic of geospatial intelligence (see Palantir, which has offices locally in Tyson's Corner, VA). In early August 2015, Audi, BMW, and Daimler purchased the geospatial intelligence division of Nokia (known as "Here") for $3.1 billion.

The need for a well-trained and nimble workforce in geospatial intelligence is growing, markedly. The US Bureau of Labor Statistics *Occupational Outlook Handbook* does not list geospatial intelligence analysts as an occupation, but does project that jobs in a related category, cartographers and photogrammetrists, is growing "much faster than average" between 2016-2026.[2] The Bureau lists the state of Maryland as one of the strongest states in the nation for jobs in the geographical sciences, mainly because of the prevalence of federal agencies.[3] As noted above, however, geospatial intelligence is spreading beyond the traditional role of geography in governmental operations.

[2] US Bureau of Labor Statistics. (September 6, 2018). Occupational Outlook Handbook: Cartographers and Photogrammetrists. Retrieved from: https://www.bls.gov/ooh/architecture-and-engineering/cartographers-and-photogrammetrists.htm.
[3] US Bureau of Labor Statistics. (March 30, 2018). Occupational Employment and Wages, May 2017 - 19-3092 Geographers. Retrieved from: https://www.bls.gov/oes/current/oes193092.htm#nat.

D. Reasonableness of Program Duplication

As an iteration of the Professional Studies program in only its second year of operation, the program has proven student interest by enrolling 13 students. The program differs from research-oriented graduate programs in Geographical Sciences, such as UMD's Master of Science in Geographical Sciences program, because the proposed program is not designed to prepare students for doctoral study. The program also differs from geospatial information science (GIS) programs, which focus on methods of handling spatial data. GIS programs do not offer significant coursework in the specific area of geospatial intelligence. Geospatial intelligence coursework focuses on the cutting-edge technologies and platforms used in the geospatial intelligence industry, including open source tools and methods and big data computing.

The only existing Master of Science program in Geospatial Intelligence in the state is Johns Hopkins University's Master of Science in Geospatial Intelligence. The Johns Hopkins program is online, whereas the proposed program will be offered on campus as well as in a distance-learning (online) format. Maryland citizens who live in Montgomery and Prince George's counties and who wish to take advantage of on-site training and lab facilities will likely participate on-site. As geospatial intelligence continues to grow in a variety of industries, the demand for graduate-level training is likely to expand.

E . Relevance to Historically Black Institutions (HBIs)

No such program currently exists at any of Maryland's Historically Black Institutions (HBIs).

F. Relevance to the identity of Historically Black Institutions (HBIs)

UMD has already established itself in the field of Geographical Sciences with its established undergraduate and graduate programs in geographical sciences. Accordingly, the proposed program would not have an impact on the uniqueness or institutional identity of any Maryland HBI.

G. Adequacy of Curriculum Design, Program Modality, and Related Learning Outcomes

Curricular Development. The program was developed to expose students to geospatial information sciences in the context of geospatial intelligence. Students are taught the fundamentals of geospatial intelligence science and technology, including geospatial data handling processes that require advanced algorithms, models, and commercial and open source platforms. Applications of these skills are explored in a variety of geospatial intelligence contexts, including public administration and policy analysis, public safety, military intelligence, emergency response and preparedness, project and workflow management, environmental applications, urban studies and regional sciences, and transportation geography.

Faculty Oversight. The program will be housed in the Department of Geographical Sciences. The Program Oversight Committee is responsible for directing the program, while the program will be administrated and managed by the Department's Center for Geospatial Information Science (CGIS).

The program will also form a program advisory committee that will include the CGIS director, Professor Kathleen Stewart, and Geographical Sciences Graduate Director, Professor Laixiang Sun.

Educational Objectives and Learning Outcomes. Students are expected to complete the program with the following learning outcomes:

- A well-rounded understanding of the fundamental nature of geospatial intelligence and analysis, including the core theory, methods, and protocols for gathering and management of geospatial intelligence data, analyses and visualization of those data, use of the resulting products in operational settings for applied geospatial intelligence, and the ethical treatment of data and analysis throughout those procedures.
- Advanced expertise in either or both of the challenges and opportunities for geospatial intelligence in human, security, and engineering domains; and technologies for future geospatial intelligence and analysis in computing, machinery, and software.
- Practical, hands-on project and lab-style training with data collection procedures, data analysis, algorithm development, using commercial and open source modeling and analysis software and platforms.
- The ability to design and implement strategies to solve real-world intelligence problems as they present across a variety of domains, including intelligence activities, security and defense, hazards and emergency response and management, and transportation and urban applications.
- Training in analytic thinking and real-world problem solving for future success in the workforce. Skills include but are not limited to interpersonal communications and teamwork, creative and critical thinking, occupational planning and organizing, problem-solving and decision making.

The learning outcomes are the same for the distance-education and on-site students.

See Appendix A for more information on learning outcomes assessment.

Institutional assessment and documentation of learning outcomes. Student learning outcomes assessment in graduate programs is directed by the Graduate Outcomes Assessment Committee. Established in 2011, this committee is comprised of representatives from each college and school. Graduate Outcomes Assessment reports for doctoral and master's programs are due every other year, with approximately half of the campus graduate programs reporting each year.

Course requirements. The curriculum will consist of 30 credits organized into the following categories:

- 15 credits of core courses
- 15 credits of elective courses

Geospatial Intelligence Core Courses (15 credits)		
Course	Title	Credits
GEOG661	Fundamentals of Geospatial Intelligence	3
GEOG662	Advances in Geographic Information Science and Remote Sensing	3
GEOG664	Geospatial Intelligence Systems and Platforms	3
GEOG665	Algorithms for Geospatial Intelligence Analysis	3
GEOG697*	Capstone Project	3

Geospatial Intelligence Elective Courses (15 credits)		
Course	Title	Credits
GEOG651	Spatial Statistics	3
GEOG656	Programming and Scripting for GIS	3
GEOG657	Web Programing	3
GEOG660	Advanced Remote Sensing Using Lidar	3
GEOG663	Big Data Analytics	3
GEOG680	Geospatial Intelligence Networks	3
GEOG682	Open Source Intelligence	3
GEOG683	Hazards and Emergency Management	3
GEOG686	Mobile Computing and Geospatial Information Management	3
GEOG684*	Image Analysis and Geovisualization	3
GEOG685*	Machine Learning and Data Mining	3
GEOG687*	Geospatial Intelligence for Security	3
GEOG688*	Human and Activity-Based Intelligence	3
GEOG690*	Data Visualization	3
GEOG691*	Food Security	3

*Courses that are planned for the program but have not yet completed the UMD course approval process.

See Appendix B for course descriptions.

General Education. Not applicable as this is as a master's program.

Accreditation or Certification Requirements. The program plans to seek the accreditation from the United States Geospatial Intelligence Foundation (USGIF). The USGIF is the only organization dedicated to promoting the geospatial intelligence tradecraft in the USA. Students do not need certification and do not need to graduate from an accredited program in order to work in this field, but accredited programs benefit the students, college, university, industry, government, and geospatial intelligence community at large by ensuring current hiring needs are reflected in cross-disciplinary coursework.

Other Institutions or Organizations. The department will not contract with another institution or non-collegiate organization for this program.

Student Support. As the program already exists as an iteration of the professional studies program, student support mechanisms are already in place. The Center for Geospatial Information Science provides a comprehensive and detailed webpage of resources for understanding curriculum, advising, technological needs (including the learning management system), relevant Graduate School policies, financial aid and cost and payment information. See https://geospatial.umd.edu/education/resources for more details.

Marketing and Admissions Information. The professional studies program iteration is clearly and accurately described in the university website: https://geospatial.umd.edu/education/master-

professional-studies-geospatial-intelligence. This website will be updated for the Master of Science program upon approval.

H. Adequacy of Articulation

As a graduate program, articulation is not applicable.

I. Adequacy of Faculty Resources

Program faculty. As the program is already offered as an iteration of the professional studies program, faculty resources are already in place. The Center for Geospatial Information Science has two full-time Lecturers for the program. These two dedicated lecturers will serve as instructors for most of the courses in the program, and some of the elective courses will be taught by other lecturers from the Geographical Sciences department. Initially, lecturers also provide lab instruction, but these responsibilities will be shifted to graduate teaching assistants as the program grows large enough to warrant the support of graduate teaching assistants (TA's) for supporting lab assignments.

In the following years, should enrollments grow as anticipated, we expect to hire one new lecturer and establishing two to three TA lines. In each case, resources for these hires will come from program revenues.

See faculty listing in Appendix C for those currently expected to teach in the program.

Faculty training. Courses are subject to constant updates with the development of the technologies in the geospatial intelligence industry. The Teaching and Learning Transformation Center at the University of Maryland inspires and supports effective, engaging, efficient, and equitable teaching innovations among the university's instructors and assistants. This team provides faculty with training, resources, professional development activities, and individualized consultation to transform their classrooms and careers.

For the learning management system, faculty teaching in this program will have access to teacher development opportunities available across campus, including those offered as part of the Teaching and Learning Transformation Center. For online elements of the coursework, instructors will work with the learning design specialists on campus to incorporate best practices when teaching in the online environment.

J. Adequacy of Library Resources

The University of Maryland Libraries has conducted an assessment of library resources required for this program. The assessment concluded that the University Libraries are able to meet, with its current resources, the curricular and research needs of the program.

K. Adequacy of Physical Facilities, Infrastructure, and Instructional Resources

The program exists already as an iteration of the professional studies program, and currently has facilities, infrastructure, and instructional resources in place. The Center for Geospatial Information Science has access to two 25-seat GIS labs with specialized software and hardware that allows students to engage in GIS training. The labs run a wide variety of commercial and open source software for GIS, remote sensing, statistical analysis, data access, image processing, mathematical analyses, graphics and 3D modeling, and software development. The Center maintains a set of location-aware devices for teaching mobile GIS. These include (1) tablets equipped with positioning and motion sensors that students can learn how to program and extract data from, (2) virtual reality media for immersive exploration of models and data, and (3) sensing devices for desktop and console computing that can generate real-time positioning, motion, and gesture captures. The Center also has high-performance computational capabilities.

For online components of the program, UMD maintains an Enterprise Learning Management System (ELMS) for coursework. ELMS is a Web-based platform for sharing course content, tracking assignments and grades, and enabling virtual collaboration and interaction. The Geospatial Intelligence program will use ELMS for all its courses. The Department of Geographical Sciences also maintains a Cisco WebEx Online course delivery platform, by which lectures, and discussions can be streamed virtually. Faculty, staff, and students can communicate in real-time using chat, voice (microphone and speakers), and video (webcam) with WebEx. WebEx allows for the ability to display presentations, annotate overtop slides, perform live editing of documents and even conduct a poll within the software. The Department maintains two dedicated servers and shared storage for server-side delivery of GIS software. All students, regardless of program modality, have access to the UMD email system.

L. Adequacy of Financial Resources

Tables 1 and 2 contain the details of resources and expenditures. This program is relatively new, and enrollments do not yet cover the full cost of the program. Startup support is being provided by the Center for Geographical Information Science. As the program matures, it is anticipated that tuition revenue will cover the cost of delivery.

M. Adequacy of Program Evaluation

Formal program review is carried out according to the University of Maryland's policy for Periodic Review of Academic Units, which includes a review of the academic programs offered by, and the research and administration of, the academic unit (http://www.president.umd.edu/policies/2014-i-600a.html). Program Review is also monitored following the guidelines of the campus-wide cycle of Learning Outcomes Assessment (https://www.irpa.umd.edu/Assessment/LOA.html). Faculty within the department are reviewed according to the University's Policy on Periodic Evaluation of Faculty Performance (http://www.president.umd.edu/policies/2014-ii-120a.html). Since 2005, the University has used an online course evaluation instrument that standardizes course evaluations across campus. The course evaluation has standard, university-wide questions and also allows for supplemental, specialized questions from the academic unit offering the course.

N. Consistency with Minority Student Achievement goals

The proposed program provides workforce-focused technical training that gives graduates the technical skills and domain expertise to qualify for mid-level career opportunities in industry and government. Most of the current students in the program are working professionals from the Washington Metropolitan Area. The program uses a recruiting model that contributes to the diversity of the university by marketing and attracting applicants from various backgrounds and regions of the world. The program markets in person at professional conferences and has on-line question and answer sessions to reach the widest possible range of potential students. UMD has stated goals for recruiting and graduating a diverse population of graduate students in its strategic plan for diversity. The Graduate School works with programs on recruiting and graduating diverse populations. Furthermore, "the provost and Graduate School will consider the success of its programs in recruiting and graduating a diverse population of graduate students when allocating institutional financial support to programs, departments, and colleges and schools."[4]

O. Relationship to Low Productivity Programs Identified by the Commission

N/A

P. Adequacy of Distance Education Programs

Should the program be approved, the goal is to offer a distance-education version of the program in order to reach a broader student population. UMD has received approval to offer programs through distance education and is a member institution of the National Council for State Authorization Reciprocity Agreements and therefore complies with C-RAC guidelines. See Appendix D for the UMD's notice to add distance education as a modality for this program.

[4] University of Maryland, College Park. (September 16, 2010). *Transforming Maryland: Expectations for Diversity and Inclusion.* (p. 20). Retrieved January 28, 2019 from: http://www.provost.umd.edu/Documents/Strategic_Plan_for_Diversity.pdf.

Table 1: Resources

Resources Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1.Reallocated Funds	$0	$0	$0	$0	$0
2. Tuition/Fee Revenue (c+g below)	$288,036	$415,348	$600,969	$734,404	$756,436
a. #FT Students	10	16	22	25	25
b. Annual Tuition/Fee Rate	$19,202	$19,778	$20,372	$20,983	$21,612
c. Annual FT Revenue (a x b)	$192,024	$316,456	$448,180	$524,575	$540,312
d. # PT Students	10	10	15	20	20
e. Credit Hour Rate	$800	$824	$849	$874	$901
f. Annual Credit Hours	12	12	12	12	12
g. Total Part Time Revenue (d x e x f)	$96,012	$98,892	$152,789	$209,830	$216,125
3. Grants, Contracts, & Other External Sources	$0	$0	$0	$0	$0
4. Other Sources	$0	$0	$0	$0	$0
TOTAL (Add 1 - 4)	**$288,036**	**$415,348**	**$600,969**	**$734,404**	**$756,436**

able 2: Estimated expenditures

Expenditure Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. Faculty (b+c below)	$212,800	$232,883	$299,837	$308,832	$318,097
a. #FTE	2.0	2.0	2.5	2.5	2.5
b. Total Salary	$160,000	$175,100	$225,441	$232,204	$239,171
c. Total Benefits	$52,800	$57,783	$74,396	$76,627	$78,926
2. Admin. Staff (b+c below)	$0	$0	$49,385	$50,866	$52,392
a. #FTE	0.0	0.0	0.5	0.5	0.5
b. Total Salary	$0	$0	$37,132	$38,245	$39,393
c. Total Benefits	$0	$0	$12,253	$12,621	$13,000
3. Total Support Staff (b+c below)	$0	$0	$84,660	$87,200	$89,816
a. #FTE	0.0	0.0	1.0	1.0	1.0
b. Total Salary	$0	$0	$63,654	$65,564	$67,531
c. Total Benefits	$0	$0	$21,006	$21,636	$22,285
4. Graduate Assistants (b+c)	$0	$76,648	$78,948	$81,316	$83,756
a. #FTE	0.0	2.0	2.0	2.0	2.0
b. Stipend	$0	$41,200	$42,436	$43,709	$45,020
c. Tuition Remission	$0	$35,448	$36,512	$37,607	$38,736
5. Equipment	$0	$0	$0	$0	$0
6. Library	$0	$0	$0	$0	$0
7. New or Renovated Space	$0	$0	$0	$0	$0
8. Other Expenses: Operational Expenses	$97,693	$118,773	$149,508	$171,602	$175,250
TOTAL (Add 1 - 8)	**$310,493**	**$428,304**	**$662,338**	**$699,817**	**$719,311**

Appendix A: Learning Outcomes Assessment for the Master of Science in Geospatial Intelligence

To ensure that these outcomes are met, the MS in Geospatial Intelligence (MS GEOINT) program will focus on coursework and course modules that emphasize:

1. Well-rounded understanding—Impose a core set of coursework to ensure that students develop a well-rounded education in the fundamentals of geospatial intelligence and analysis, with courses that cover basics of the profession and science, technical offerings, and ethics.
2. Advanced expertise—Offer a series of balanced electives that build on that core with advanced coverage of topics of a substantive nature and/or a technical nature.
3. Practical training—A capstone project will be required of all students, affording them the opportunity to develop hands-on problem-solving skills on operational intelligence tasks.
4. Lab skills—In each course, a set of projects or lab exercises will ensure that students apply their theoretical knowledge to actionable topics in geospatial intelligence and analysis.
5. Workforce success—A dedicated course will be offered to train students in the art and practice of thinking and acting entrepreneurially, so that they are well-prepared for success in the workplace.

Our success in guiding students through the outcomes will be evaluated using a set of varied metrics and instruments:

1. In-class observation–Assessments will be carried out throughout the program to gauge (1) student involvement, (2) student interest and engagement, (3) student performance, (4) faculty performance, and (5) the nature of the learning environment. This assessment will be carried out by informal observation by other faculties in the MS GEOINT program, as well as by faculty in the Department of Geographical Sciences. Unstructured (quick chats and check-ins) and structured (survey questions) data will be collected to support these observations.
2. Student participation—Will be gauged through checks on attendance and progression through course milestones (submitting assignments and projects in a timely manner). Where content is provided digitally (through Adobe Connect or via ELMS, for example), empirical metrics for students' access to course resources can also be evaluated.
3. Student feedback—Will be collected through open sessions (office hours or question-and-answer sessions) and formal evaluation events (end-of-course evaluation). Upon graduating from the course, we will also hold student exit interviews to gather feedback on their success in the course and in meeting our learning outcomes objectives.
4. Capstone project—The capstone project is one of the main culminating course experiences for the MS GEOINT program. Each capstone project will be evaluated in a dedicated review session and evidence of learning outcomes as they present in the projects will be assessed.

Appendix B: Course Descriptions

Core Courses

GEOG 661: Fundamentals of GEOINT (3 Credits)
Geospatial Intelligence (GEOINT) is the collection, analysis, visualization and dissemination of geospatial information to support decision-making. This course introduces the fundamental knowledge required to become a successful GEOINT practitioner, including the history of the GEOINT discipline, the intelligence applications of remote sensing and Geographic Information Systems (GIS) technologies, and how GEOINT products are used to support national security and humanitarian missions. Upon completion of this course you will understand the roles that technology, policy, doctrine, government, and industry play in shaping the Geospatial Intelligence discipline, and develop the technical knowledge and domain expertise to create basic GEOINT products that provide context for decision makers.

GEOG 662: Advances in GIS and Remote Sensing (3 Credits)
Focuses on state-of-the-art advances in geographic information science and remote sensing as they support geospatial intelligence. Focus on synergies between GIS and remote sensing in informatics, computer science, and spatial engineering, and their application to problem domains in human systems, physical systems, and cyberspace. Advances in GIS presents recent advances regarding fundamental issues of geo-spatial information science (space and time, spatial analysis, uncertainty modeling and geo-visualization), and new scientific and technological research initiatives for geo-spatial information science (such as spatial data mining, mobile data modeling, and location-based services). Advances in remote sensing will provide opportunity to understand and work with latest developments in the Remote Sensing datasets. The curriculum covers wide range of remote sensing data interpretation and their processing techniques.

GEOG 664: GEOINT Systems and Platforms (3 Credits)
There are numerous systems and platforms that support the collection, visualization and dissemination of Geospatial Intelligence (GEOINT). Platforms such as satellites and aircraft carry sensors systems that can detect both physical and man-made objects on the earth. Ground-based processing systems are used to analyze and visualize sensor data, and also to create and disseminate GEOINT products that guide decision-making. In this course you will learn how to develop and implement source-to-screen GEOINT workflows and will understand how to use a system of systems approach to describe the programmatic and technical strengths and weaknesses of many different GEOINT systems and platforms.

GEOG 665: Algorithms for GEOINT Analysis (3 Credits)
Exposes students to fundamental algorithms in geospatial intelligence and their application in methodological and substantive domains, and their implementation in computer programs and software systems. Current topics include spatial and space-time analysis, cartographic transformations, data compression and reduction, MapReduce and distributed data access, genetic algorithms, clustering and indexing algorithms, filtering algorithms, geometry and tessellation algorithms, routing

algorithms, localization algorithms, and complexity and scaling. Implementation of algorithms will be explored through pseudo-code and a variety of scripting, data access, and programming languages.

**GEOG 697: Capstone Project (3 Credits)*
The Capstone is an independent research project that demonstrates competence in geospatial intelligence technologies. This project can originate from an internship, from relevant work at a current or past employer, or can be developed in conjunction with CGIS faculty. The student will prepare a project report and presentation which shall contain an executive summary, background information including a literature review and establishment of requirements, a detailed technical description of the project data and methods, a discussion of results obtained, and final conclusions and recommendations. The final project submission will include all data, computer code and/or workflow documentation required to replicate the project results. In completing this project, students develop a concrete example of how GEOINT technologies can be applied to solve real-world problems and begin developing a portfolio that can be presented to potential employers.

Elective Courses

GEOG651: Spatial Statistics (3 Credits)
This course is about quantitative analysis of spatial data. It is intended to provide a broad survey of various spatial statistic methods. The course is geared towards helping students: (1) develop an understanding of the important theoretical concepts in spatial data analysis; and (2) gain practical experience in the application of spatial statistics to a variety of social and environmental problems using the advanced statistical software. This course covers five broad topical areas: (1) point pattern analysis; (2) area data analysis; (3) continuous data analysis; (4) spatial sampling; and (5) multivariate spatial and temporal analysis.

GEOG656: Programming and Scripting for GIS (3 Credits)
An introduction to programming and scripting for intermediate GIS users. The fundamental concepts of computer programming will be introduced within the Geoprocessing framework in ArcGIS primarily using Python. Basic concepts of object-oriented programming and scripting will be presented. Students will develop skills in programming techniques to explore, manipulate and model spatial data using the Geoprocessor methods.

GEOG657: Web Programming (3 Credits)
Intermediate course designed to teach students the techniques for Web development, particularly creating dynamic and data-driven Web applications. Introduces a high-level, object-oriented programming language such as VB.Net and the designing, coding, debugging, testing, and documenting for the development of Web-based applications. Other popular Web development tools such as DHTML, CSS and PHP are also covered.

GEOG660: Advanced Remote Sensing using Lidar (3 Credits)
Lidar, also known as laser scanning, is an active remote sensing tool that can produce high-resolution point clouds. Lidar is being applied to problems such as terrain modeling, biomass estimation, change detection, feature extraction, and measuring tree canopy. Topics covered are fundamentals of lidar,

current developments in lidar technology, and different applications where lidar is being used. Students will get hands-on learning about lidar data management, processing, and analysis.

GEOG 663: Big Data Analytics (3 Credits)
Designed to introduce statistical analysis over big data sets (and tackling big data problems), primarily in geography and spatial sciences, but with broader appeal throughout the socio-behavioral sciences. Students will be introduced to a range of methods that can be applied to the exploration, modeling, and visualization of big quantitative data. This course explores data fusion, statistical analysis, and data-mining for geospatial and non-geospatial data in structured and unstructured form, with an emphasis on large silos of data across diverse sources and assumptions. Topics will include open sourcing, metadata schemes, data standards and models, data-access, data-mining, clustering methods, classifiers, data reduction, machine learning, filtering schemes, real-time and streaming data, archiving and preservation, and handling uncertainty.

**GEOG 680: Geospatial Intelligence Networks (3 Credits)*
Networks are an important part of the Geospatial Intelligence (GEOINT) cycle, from the sensor networks that are used to collect raw geospatial information to the telecommunication networks that are used to disseminate finished GEOINT products. Transportation networks, computer networks, social networks, and many other man-made and natural features can also be characterized by a link-node network topology and can be studied using network science methods. Upon completion of this course you will be able characterize and classify real-world GEOINT networks and their components, understand network dynamics including routing, scalability, and robustness, and be able to apply engineering methods for network design and network analysis.

GEOG 682: Open Source Intelligence (3 Credits)
Open Source Intelligence (OSINT) is information that is publicly available which is collected and analyzed to support decision-making. The collection and analysis of OSINT is often considered to be the first step in developing an "all-source" intelligence product, where OSINT is fused with Geospatial Intelligence (GEOINT), Signals Intelligence (SIGINT), and Measurement and Signature Intelligence (MASINT), and Human Intelligence (HUMINT). In this course you will learn about the sources, ethics, and methods that are associated with OSINT, and will also develop knowledge and skills related to open-source geospatial technologies and organizations such as the Open Geospatial Consortium (OGC).

**GEOG 683: Hazards and Emergency Management (3 Credits)*
Timely and accurate Geospatial Intelligence (GEOINT) is essential for protecting people from hazardous events such as floods, wildfires, tsunamis, hurricanes, industrial accidents, and terrorist attacks. GEOINT plays a critical role in all four stages of emergency management: preparedness, mitigation, response, and recovery. The use of remote sensing and Geographic Information Systems (GIS) before, during, and after Hurricane Katrina and the 9/11 terror attacks are two of the case studies that are discussed during this course. You will develop a deeper understanding of the emergency management successes and failures that occurred during these historic and deadly events and learn the technical skills to develop and disseminate GEOINT products that support decision-making at all four stages of emergency management.

**GEOG684: Image Analysis and Geovisualization (3 Credits)*
This course explores image processing routines atop remotely-sensed data from a variety of multispectral, hyperspectral, radar, and microwave platforms, including data preparation and enhancement, feature transformation, classification, pattern detection, and feature extraction. It explore next-generation platforms for machine vision, including commercial sensors in location-aware devices and gaming devices, car sensor systems, and security cameras, and methods for object detection and tracking, structure from motion, and gait and expression analysis. It will also cover computer cartography, scientific visualization, handling high-dimensional data, and animation.

**GEOG685: Machine Learning and Data Mining (3 Credits)*
This course provides a basic introduction to Machine learning and Data mining, a dynamic and fast evolving subfield of artificial intelligence that learn from past experience and find useful patterns in data. Topics include the three basic branches in this field: (1) Supervised learning to predict problems; (2) Unsupervised learning for clustering data and discovering patterns from data; and (3) Reinforcement learning for decision making. The course will not only learn various machine learning and data mining techniques, but also learn how to apply them to real problems in practice including character recognition, speech recognition, text mining, document classification, pattern recognition, social media analysis, and information extraction from web pages.

GEOG 686: Mobile Computing and Geospatial Information Management (3 Credits)
An introduction to mobile GIS, to the programming concepts underlying mobile GIS development, and more importantly, to the design and implementation of a mobile GIS application. The course covers how to develop, test, and publish mobile GIS native apps working across two mobile platforms: Android and iOS. It also leverages the capabilities of JavaScript, Swift, Google maps, ArcGIS Server and runtime SDK to developing and publishing mobile GIS apps.

**GEOG687: Geospatial Intelligence for Security (3 Credits)*
This course focuses on security problem-sets, opportunities, methods, and applications of geospatial intelligence in security four main domains. First, in defense and homeland security, the course will examine how geospatial intelligence supports military operations (including operations other than war) and national security initiatives. Second, in the domain of crime, the course will explore how geospatial intelligence is used in law enforcement, crime prevention, and forensic analysis. Third, the course examines the role of geospatial intelligence in cyber-security, including topics such as cyber-crime, location spoofing, and space-time dynamics of computer virus and service attacks, fraud, and SPAM. Fourth, the course treats geospatial intelligence as it relates to the identification, analysis, evaluation, management, and response to hazards, crises, and critical scenarios. Here, we focus on both natural and on man-made phenomena and systems, as well as interactions between them.

**GEOG688: Human and Activity-Based Intelligence (3 Credits)*
This course focuses on the applied human domain of geospatial intelligence and its relationship to social and behavioral science. It begins with a review of human geography, behavioral geography, political geography, and cultural geography and their relationships to human intelligence gathering. It then focuses on fundamental and emerging techniques for activity-based intelligence. Current topics

include migration and flow, movement analytics, transportation analytics, time geography and event conceptualization, transactions and interactions, and social and cyber-physical networks.

**GEOG690: Data Visualization (3 Credits)*
Data visualization techniques provide people with enhanced perceptual and cognitive abilities to understand and extract information from increasing amounts of data. This course will introduce a number of common data domains and corresponding analysis tasks, including multivariate data, networks, text, and spatial data. Students will learn offline data visualization tools as well as interactive web techniques to create visualizations that allow viewers from all backgrounds to interact with data and gain insight into data through the data's presentation. This course will also cover computer cartography, handling high-dimensional data, and dynamic visualization.

** GEOG691: Food Security (3 Credits)*
Measuring human food security is an important application of geospatial intelligence. Remote sensing resources can be used to identify regions where food insecurity may occur, and geospatial data fusion can help analysts understand and predict broader national security implications. Course topics include monitoring crop conditions using multispectral imagery, developing products to manage agricultural areas, analyzing the complexity and diversity of food production systems, and integrating socioeconomic and demographic data into geospatial analysis processes and decision support products.

**Courses are being developed or moving through the UMD course approval process.*

Appendix C: Faculty

Dr. Micah Brachman, Full-time, Professional Track Faculty.
Micah Brachman is a Lecturer in the Center for Geospatial Information Science at UMD. He holds a Ph.D. (2012) and M.A. (2009) in Geography from the University of California, Santa Barbara and a B.S. (2000) in Geography from the University of Minnesota. Micah has extensive professional experience in GIS and Remote Sensing in the commercial, government, and non-profit sectors, and recently transitioned from a Geospatial Scientist position supporting the Army Geospatial Center to teach in the new Geospatial Intelligence (GEOINT) program. In addition to GEOINT, Micah is also actively engaged in teaching and scholarship in Hazards and Emergency Management, Network Science, and Active Transportation.
Courses to teach in program:
GEOG661, GEOG664, GEOG680, GEOG682, GEOG683

Dr. Junchuan Fan, Full-time, Professional Track Faculty.
Dr. Junchuan Fan is a postdoctoral research associate with the Center for Geospatial Information Science at UMD. His research is focused on spatiotemporal modeling and analysis of naturalistic driving behaviors, big geospatial data mining on human activity and movement dynamics, geospatial semantics, and smart cities. Dr. Fan has been involved in research projects funded by FDOT, MSHA, National Advanced Driving Simulator (NADS), and IARPA. He teaches courses on open source GIS, spatial databases, web mapping, and geospatial semantic data handling.
Courses to teach in program:
GEOG684, GEOG687, GEOG688

Dr. Ruibo Han, Full-time, Professional Track Faculty.
Dr. Ruibo Han is the Director and Senior Lecturer of the Master and Graduate Certificate programs of Professional Studies in Geospatial Intelligence in the Center for Geospatial Information Science at the UMD. He also teaches courses in both of the program, as well as the graduate and undergraduate programs in the Department of Geographical Sciences. Ruibo earned his Ph.D. in Geography from the University of Ottawa and formerly worked at the University of Ottawa and the University of Toronto teaching courses in GIS and Statistics. Ruibo's research and teaching interests include urban dynamics, web and mobile GIS, big data analytics, and public participatory geospatial systems, and he has received research funded and produced publications in these fields.
Courses to teach in program:
GEOG662, GEOG663, GEOG665, GEOG685, GEOG686, GEOG697

Dr. Eunjung Elle Lim, Full-time, Professional Track Faculty.
Dr. Lim earned a Ph.D. degree in Geography (GIS specialty) from the State University of New York at Buffalo. Her dissertation is about methodology detecting a sequence of changes in dynamic spatiotemporal data and investigating patterns of detected changes. In her dissertation she dealt emergency vehicle location and allocation strategies coping with time-varying emergency 911 calls. Her specialty is geographic information sciences. In the realm of GIS, she has developed special interest and knowledge in GIS modeling, programming, network analysis, and spatial statistics. She has about 12

years of experience developing software using Java, C, C++, Visual Basic and relational databases. She is very interested in designing and developing new functionalities in GIS that provide abilities to make users perform tasks that they even haven't thought they can do with geographical knowledge.
Courses to teach in program:
GEOG651, GEOG657

Dr. Jonathan Resop, Full-time, Professional Track Faculty.
Dr. Jonathan Resop earned his Ph.D. at Virginia Tech in Biological Systems Engineering. During his time at Virginia Tech, he worked on multiple projects related to spatial modeling and remote sensing, in particular problems that involve agricultural and environmental systems. His dissertation involved applying ground-based lidar to various ecological applications. After completing his Ph.D., he worked as a post-doc for the USDA-ARS in Beltsville in the Crop Systems and Global Change Lab, doing research related to simulating the potential production capacity of crops within regional food systems using a geospatial crop model. Jonathan received his undergraduate degrees at the University of Maryland, College Park in Biological Resources Engineering and Computer Science.
Courses to teach in program:
GEOG656, GEOG660

Dr. Kathleen Stewart, Full-time, Tenure-Track Faculty
Kathleen Stewart is Director of the Center for Geospatial Information Science and works in the area of geographic information science with a particular focus on geospatial dynamics. This includes topics such as moving objects research (e.g., space-time trajectories, space-time scheduling) and event modeling for dynamic GIS. She is interested in mobility, spatial accessibility, big geospatial data, and currently investigates movement and mobility for a number of different application domains, for example, health and transportation. She is also interested in modeling geospatial semantics including geospatial ontologies and their role for geographic information system design, and spatiotemporal information retrieval. At the University of Maryland, Dr. Stewart is a member of the Program in Oncology at the University of Maryland Marlene and Stewart Greenebaum Comprehensive Cancer Center and also collaborates with researchers at the Institute for Global Health, the Center for Substance Abuse Research, the National Transportation Center, the School of Public Health, and among others. Her research is currently supported in part by grants from the National Institutes of Health, NASA, and the Federal Highway Administration, among other organizations, and she has also received support from IARPA, NGA and NSA. Dr. Stewart serves as a member of the Mapping Science Committee of the National Academies of Sciences, Engineering and Medicine and the Board of Directors for the University Consortium of Geographic Information Science. She is a member of the steering committee for the Maryland Transportation Institute. She also serves as a member of the editorial boards for The International Journal of Geographical Information Science (IJGIS), Computers, Environment, and Urban Systems, Transactions in GIS, Geographical Analysis, and the open-access Journal of Spatial Information Science (JOSIS).

Appendix D Distance-Education Offering of Program

The Maryland Higher Education Commission

Change in Program Modality Request Form

Institutions may change an approved program's modality.

An institution of higher education that has received approval to operate a program in the state of Maryland may add, change, suspend, or discontinue a program modality if the institution provides advance notice to the Commission in accordance with COMAR 13B.02.03.29 and COMAR 13B.02.03.22

An institution's notice to the Commission shall include:

Provide the program's title and degree level:

Master of Science in Geospatial Intelligence

Provide the program's HEGIS and CIP code:

HEGIS: 220602
CIP: 29.0203

Provide a description of, and rationale for, the addition, change, suspensions, or discontinuation of program modality:

In order to reach a broader range of students, courses will be delivered in a hybrid format. Instructors will present lectures and lead discussions in a regular classroom setting, while also streaming the lectures online. Students that can attend in person may do so, while those that require or prefer remote access can also participate (via WebEx technology). Similarly, laboratory sessions may be attended tangibly, or students may access instruction remotely using video conferencing and virtual machine access to our software and data in the Department of Geographical Sciences.

Provide an affirmation that the program's most recently approved curriculum and objective are coherent, cohesive, and comparable, regardless of program modality:

Students in the distance-education format are taking the same courses as the students who are on campus. The program objectives and outcomes are therefore the same as they are for the on-campus modality.

Provide the planned implementation date of the addition, change, suspension, or discontinuation of program modality:

August 1, 2019

For any suspension or discontinuation of a program modality;

Provide the number of students enrolled in the program who are using that program modality and their expected graduation dates:

N/A

Provide a plan that covers each of the students using the program's modality to ensure that:

The student's time to completion of the program is not increased;
Students and faculty continue to have access to course material, student services, and academic support for the duration of the program.

The proposed program will be delivered in a hybrid format, thus all students will be taking the same courses. Some students will be in the classroom and some will be attending remotely. Those who attend remotely have access to on-campus resources equal to on-site students. The distance-education students follow the same course plan as the on-site students. All available resources for our current MPS GEOINT program are listed on our program website (https://geospatial.umd.edu/education/resources).

Please submit the coversheet and Program Modality Request form to the Secretary via postal mail or electionally to acadprog.mhec@maryland.gov

UNIVERSITY SYSTEM of MARYLAND

BOARD OF REGENTS

SUMMARY OF ITEM FOR ACTION, INFORMATION, OR DISCUSSION

TOPIC: Proposals of New Academic Titles and Ranks: University of Maryland, Baltimore and University of Maryland, Baltimore County

COMMITTEE: Education Policy and Student Life

DATE OF COMMITTEE MEETING: Tuesday, March 5, 2019

SUMMARY: The University of Maryland, Baltimore and the University of Maryland, Baltimore County present requests for approval to establish new ranks and titles to be included in their institutional appointment, promotion/rank, and tenure policies (APT; ART) and, subsequently, to be used by their faculty. Currently, faculty ranks are listed in the USM Policy on Appointment, Promotion, and Tenure of Faculty (II-1.00). Section II. A. 2., *Faculty Ranks, Promotion, Tenure, and Permanent Status; General Principles*, of the USM APT policy states, "In addition to the ranks listed in II.C (below), there may also be such other faculty ranks as institutions shall define and include in their respective appointment, rank, and tenure policies, subject to the approval of the Board of Regents."

Prior to the current requests, new ranks and titles approved by the board would have been inserted in the aforementioned USM policy. However, the Office of Academic and Student Affairs plans to revise the APT policy with a major change being the deletion of the entire section of several pages that lists every faculty title at every USM institution. Subsequently, USM staff, in consultation with the Office of the Attorney General, supports these institutions' requests for approval to insert these titles and ranks to their *institution's* appointment, promotion/rank, and tenure policies without inserting the titles to the USM APT policy. Even though one institution having these titles would not obligate every institution to have the same titles, USM has consulted with the institutions' provosts, and they are also in agreement with the plan for institutions' titles to be brought to the Board of Regents for approval without including those titles in the USM policy, which will undergo major revisions in the near future.

Letters are attached to describe the following requests to adopt the identified ranks and titles for use at the respective institution:

University of Maryland, Baltimore
Graduate School Assistant Professor
Graduate School Associate Professor
Graduate School Professor

University of Maryland, Baltimore County
Part-Time Adjunct III
Full-Time Principal Lecturer

Dr. Joann Boughman will present these proposals, and the institutions' provosts are available to offer comments and answer questions.

ALTERNATIVE(S): The Regents may not approve these requests or may request further information.

FISCAL IMPACT: There is no fiscal impact associated with this proposal.

CHANCELLOR'S RECOMMENDATION: That the Education Policy and Student Life Committee recommend that the Board of Regents approve the University of Maryland, Baltimore's request to adopt the ranks of Graduate School Assistant Professor, Graduate School Associate Professor, and Graduate School Professor for use at the institution.

That the Education Policy and Student Life Committee recommend that the Board of Regents approve the University of Maryland, Baltimore County's request to adopt the ranks of Part-Time Adjunct III and Full-Time Principal Lecturer for use at the institution.

COMMITTEE RECOMMENDATION:		DATE: March 5, 2019
BOARD ACTION:		DATE:
SUBMITTED BY: Joann A. Boughman	301-445-1992	jboughman@usmd.edu

UNIVERSITY of MARYLAND
GRADUATE SCHOOL

FLAVIUS R. W. LILLY, PhD, MA, MPH
Senior Associate Dean

University of Maryland Graduate School
620 West Lexington Street
Baltimore, MD 21201
410 706 7767
flilly@umaryland.edu

www.graduate.umaryland.edu

December 13, 2018

Joann Boughman, PhD
Senior Vice Chancellor for Academic and Student Affairs
University System of Maryland
3300 Metzerott Road
Adelphi, MD 20783-1690

Dear Dr. Boughman,

The University of Maryland, Baltimore (UMB) Graduate School desires to appoint faculty on the non-tenure track at the ranks of assistant professor, associate professor and professor. We are working to amend the Graduate School advancement and promotion policy to include appointments at these ranks on the non-tenure track. The new ranks are needed to afford faculty within the Graduate School professional advancement and to allow the School to appoint senior level individuals.

However, in order to amend our policy, the Board of Regents must approve the addition of the following non-tenure track titles:

Graduate School Assistant Professor
Graduate School Associate Professor
Graduate School Professor

These new titles will be used to appointment Graduate School non-tenure track faculty in the professorial ranks. The faculty in the UMB Graduate School requested this change through our shared governance process. The Dean's office agreed to help facilitate this policy change. Once UMB is permitted to offer these faculty ranks, the proposed advancement and promotion policy will go through shared governance review by the faculty.

Sincerely,

Flavius Lilly

cc: Dr. Bruce Jarrell, Provost and Dean, Graduate School
Dr. Roger Ward, Vice Dean, Graduate School
Dr. Erin Golembewski, Senior Associate Dean, Graduate School
Mr. Jim Reynolds, Assistant Vice President, Academic Affairs

UMBC

AN HONORS UNIVERSITY IN MARYLAND

Office of the Provost
University of Maryland, Baltimore County
1000 Hilltop Circle
Baltimore, Maryland 21250

PHONE: 410-455-2333
FAX: 410-455-1107
WEB: www.umbc.edu

January 28, 2019

TO: Dr. Joann Boughman
Senior Vice Chancellor for Academic Student Success

FROM: Dr. Philip J. Rous
Provost and Senior Vice President

RE: UMBC Requests Principal Lecturer and Adjunct III Ranks

Upon the recommendation of the Faculty Senate, the Adjunct Faculty Advisory Committee, the Council of Deans, Council of Vice Presidents and Deans, the Provost and the President, UMBC is requesting approval to adopt the ranks of full-time Principal Lecturer and part-time Adjunct III for our campus. In each case, these ranks would make available, and establish the criteria for, a third and higher rank beyond Senior Lecturer and Adjunct II for non-tenure track full-time and part-time faculty respectively.

The need for these additional faculty ranks was identified in UMBC's most recent strategic plan and the recommendations of our 2016 Middle States Self-Study and accreditation review. Approval of these faculty ranks will allow UMBC to advance core drivers of student success by appropriately recognizing, rewarding and retaining a select group of outstanding non-tenure/tenure track faculty that has demonstrated an advanced and long-term commitment to teaching excellence, curricular innovation and pedagogical leadership at UMBC.

Under the implementation protocols of the recommendations of the 2016 UMBC strategic plan and 2016 Middle States Self-Study, UMBC's administration and our shared governance bodies were charged with identifying and implementing specific operational actions to advance the strategic goals of increased student success. Working closely with our Adjunct Faculty Advisory Committee, UMBC's Faculty Affairs Committee, Faculty Senate and other related constituencies over the course of two years, these additional faculty ranks and the criteria for promotion to these ranks were approved by the Faculty Senate on April 13, 2018.

The recommendation to adopt these ranks was forwarded from Faculty Senate to President Freeman Hrabowski on June 21, 2018. President Hrabowski strongly supports the implementation of this recommendation, subject to permission being granted by the USM Board of Regents. Such permission is being sought at this time.

Please let me know you need additional information.

UNIVERSITY SYSTEM of MARYLAND

BOARD OF REGENTS

SUMMARY OF ITEM FOR ACTION, INFORMATION, OR DISCUSSION

TOPIC: Proposed USM Student Council Constitutional Amendments

COMMITTEE: Education Policy and Student Life

DATE OF COMMITTEE MEETING: Tuesday, March 5, 2019

SUMMARY: Concerns were raised at the September 2017 meeting of the USMSC related to the congruence of the documents that govern the USMSC. Issues of concern were:

(1) awkwardness of approving regional center participation;

(2) conflicts in procedures related to officers between the Constitution and the Bylaws; and

(3) overall addition of details in what many in the USMSC see as an overview-providing document.

In March 2018, the committee initially proposed that the USMSC Constitution and the USMSC Bylaws should be modified to handle the above concerns as follows:

(1) State the composition of the USMSC. Additional regional centers or institutions will therefore require an amendment to this document.

(2) Discussion of only structure of USMSC in Constitution. Responsibilities of members, Executive Council, and Board of Directors will be detailed in Bylaws.

(3) Delegation of points of procedure not relating to the Constitution itself (e.g., amendment procedures) to the Bylaws.

The removal of the Student Regent selection process is a notable change. The Student Regent selection process is broadly described in the USM Policy on the USM Student Council (I-3.00). The Council will determine what aspects of the Student Regent selection process should be included in the Council Bylaws. The USMSC notes that the selection of the Student Regent is one of its primary tasks each year and that the movement of the process to a more flexible document (i.e., the Bylaws, whose amendments receive USM Office review but do not require BOR approval) does not reflect a desire to change the process, but a wish to streamline and simplify the documents that new students use each year to understand their role in shared governance within the USM. The movement of this process from the Constitution into the Bylaws also leaves room for adjustments to be made simply if current or future legislation regarding the composition of the Board of Regents and, necessarily, the student regent should pass.

These amendments were discussed during the October 2018 and February 2019 USMSC meetings. On February 10, 2019, the USMSC voted unanimously to approve these amendments and present them to the Committee on Education Policy and Student Life and, subsequently, the full Board of Regents for approval.

ALTERNATIVE(S): The regents may not approve the amendments, may make recommendations, or may ask for additional information.

FISCAL IMPACT: There is no fiscal impact associated with these proposed amendments.

CHANCELLOR'S RECOMMENDATION: This is an information item.

COMMITTEE RECOMMENDATION:		DATE: March 5, 2019
BOARD ACTION:		DATE:
SUBMITTED BY: Joann A. Boughman	301-445-1992	jboughman@usmd.edu

I-3.01 UNIVERSITY SYSTEM OF MARYLAND STUDENT COUNCIL CONSTITUTION
(As approved by the Board of Regents, June 10, 1994;
Amended July 13, 2001; Amended April 13, 2012; Amended _____)

SECTION I: MISSION AND PURPOSE

The University System of Maryland Student Council (USMSC) is an apolitical advisory board established to assist the Chancellor. The Council derives its authority from the Board of Regents and shall act as a conduit for communication between students and the Chancellor and the Board of Regents. In keeping with its proactive nature, the Council will propose new policies and policy changes to both the Chancellor and the Board of Regents, as well as review other proposed policies.

Deleted: , hereafter referred to as the "Council",

The primary function of the USMSC will be to advise the Chancellor on issues, matters, and policies having direct bearing on students and student affairs of the System as a whole. In fulfilling this function, the Council will transmit to the Chancellor its majority and minority views on behalf of its constituent student bodies.

Deleted: Council

The Council will also function as a network for sharing ideas and concerns of general interest to students and act as resource contacts for student government associations on the individual campuses.

SECTION II: STRUCTURE AND REPRESENTATION

~~(A) Each degree-granting institution will have two (2) representatives on the University System of Maryland Student Council ("Council"). The method of selection will be determined by the student government(s) or student council(s) of each institution or regional center, except the University of Maryland University College, which will determine its own method. The representatives will be determined with the advice and consent of the institution president or Regional Center executive director. It is not necessary that the representatives be members of any student government association or student council.~~

~~(i) Regional Centers. University System of Maryland Regional Centers shall submit petitions for full membership to the Council. Regional Centers who wish to continue their membership with the council will submit a resolution before the Council on the last meeting of the Council's schedule. The Council must pass the resolution in order for the Regional Centers to obtain full membership in the succeeding Council year.~~

~~(B) Each degree-granting institution or Regional Center shall have one vote on the council. Regional Centers may be granted full-voting rights upon Council approval pursuant to Section I.A.i. Only the representatives will be allowed to vote. No absentee or proxy votes will be allowed.~~

~~(C) The Student Regent will be an ex-officio member of the Council.~~

~~(D) The representatives will serve a term from May to the following May.~~

A. The USMSC is primarily composed of two Representatives from the following degree-granting USM institutions and regional centers: (1) Bowie State University; (2) Coppin State University; (3) Frostburg State University; (4) Salisbury University; (5) Towson University; (6) University of Baltimore; (7) University of Maryland, Baltimore; (8) University of Maryland, Baltimore County; (9) University of Maryland, College Park; (10) University of Maryland, Eastern Shore; (11) University of Maryland, University College; (12) University of Maryland, Center for Environmental Science; (13) Universities at Shady Grove; and (14) USM at Hagerstown.

B. The USMSC Executive Board shall be composed of elected officers limited to: President, Vice President of Graduate Affairs, and Vice President of Undergraduate Affairs.

C. Participants in the USMSC that support the function and mission of various aspects of the USMSC compose the Board of Directors.

D. Ex-Officio members to the USMSC are:
a. The Student Regent; and
b. USM System Office representatives.

Commented [ZL1]: •Rewording section describing which institutions are able to have representation.
•Inclusion of the regional centers in the main list makes the separate regional center section unnecessary.
•Including USM officials as ex-officio
•Functional roles and voting rights moved into bylaws.
•Length of term moved into bylaws.

~~SECTION II: OFFICERS AND DUTIES~~

~~(A) The Chairperson calls and presides at all meetings of the Council. He or she will appoint, with majority approval of all Council representative present, the Chairperson of all committees created by the Council and serves as an ex-officio member of each. The Chairperson reports to the Chancellor and the Board of Regents.~~

~~(B) The Vice-Chairperson assumes the duties of the Chairperson during his or her absence or disability. He or she will perform such additional duties as the Chairperson requests.~~

~~(C) The Secretary-Treasurer will maintain the minutes, rolls and other such records of all regular and closed meetings of the Council. He or she is responsible for distributing the minutes and financial reports of the Council to its members and for sending out written notices of all regular and special meetings. He or she will perform such additional duties as the Chairperson may request. The Secretary-Treasurer will formulate a semi-annual report of the financial activity of the Council, if applicable.~~

Commented [ZL2]: Procedural language moved into bylaws.

~~SECTION III: ELECTION OF OFFICERS~~

~~(A) Election of officers for the succeeding Council year will be held annually, on the last day of the Council year. Vacancies that occur during the Council year will be filled by the Council.~~

~~(B) All members are eligible to run for officer positions, including Regional Center representatives upon the approval of their membership.~~

(C) The Student Regent will plan and execute the Council elections. The Student Regent will count the votes and announce the new officers immediately after the balloting.

(D) Voting will be by secret ballot.

(E) New officers will be determined by simple majority.

Commented [ZL3]: Procedural language moved into bylaws.

SECTION IV: STUDENT REGENT SELECTION PROCESS

(A) The Council will conduct the Student Regent selection process at its December meeting.

(B) Each of the eleven degree-granting institutions in the University System of Maryland may nominate a student to be interviewed at the December meeting. Students attending Regional Centers may submit applications for Student Regent in their home institutions. Granting institution or Regional Center shall have one vote on the Council. Regional Centers may be granted full-voting rights upon Council approval pursuant to Section I.A.i. Only the representatives will be allowed to vote. No absentee or proxy votes will be allowed.

(C) Within five days of the December meeting, the Chairperson of the Council will send a letter to the Chancellor certifying that the selection process was carried out in accordance with this Constitution and the corresponding bylaws and transmitting the names of the Council's nominees for the position of Student Regent.

(D) The selection process may be further elaborated in the bylaws.

(E) Regional Center representatives may participate in the interview process and the deliberation, but will not be able to cast a vote for the Council's nominees for Student Regent.

Commented [ZL4]: The Council wishes to remove this level of detail from the Constitution. The student regent selection process is broadly described in the USM Policy on the USM Student Council (I-3.00), and the Council will work to insert appropriate language into the Bylaws and/or other internal, guiding documents.

SECTION III: MEETINGS

Deleted: V

(A) The Council will meet at least twice a semester, with time and place decided upon by a majority of the members at an official meeting.

(B) Special meetings, including meetings over the summer term and winter break, may be called by the Chairperson or upon petition by a simple majority of the Council membership. At least ten (10) days notice is *required* for such meetings to be official.

(C) The Council will meet at least once a year with the Chancellor.

~~(D) The Council meetings will be open to all interested persons unless an Executive Session is called for by simple majority vote of the members present.~~

Commented [ZL5]: Too nuanced and procedural. Opting for broader language to guide meetings.

A. A simple majority of the active USM institutions and regional centers, as defined by the Bylaws, will constitute a quorum.

B. An official meeting of the USMSC is one where quorum is met with additional constraints according to the Bylaws.

C. Official meetings of the USMSC will be open to all interested persons, unless a closed session is called during an official meeting.

~~SECTION VI: ATTENDANCE AT MEETINGS~~

~~(A) Attendance at all meetings is expected. Upon the absence of a representative, the Secretary shall send a letter to the president of the student government or student council representative's institution or Regional Center declaring the absence. The Chairperson of the Council and the representatives absent shall receive copies of the correspondence. After two absences, a letter recommending resignation of the representative will be sent to the Vice President for Student Affairs or the Executive Director of Regional Centers.~~

~~(B) If an institution is not represented for two consecutive meetings, the Chairperson may appoint, with Council approval, appropriate representation for that institution or Regional Centers, to serve with full voting rights until duly selected representatives attend.~~

~~SECTION VII: REMOVAL OF OFFICERS~~

~~(A) Removal proceedings may be initiated against an officer for failure to carry out his or her respective duties as outlined in the constitution.~~

~~(B) A majority of the voting representatives will be required to initiate the removal process.~~

~~(C) The accused has the following rights:~~

~~(i) Notificationofdate,time,placeofthehearing,bycertifiedmailatleast fourteen (14) days in advance of the hearing;~~

~~(ii) A copy of the charges and the evidence upon which the charges are included with the notification;~~

~~(iii) An advisor of his or her choice may be presented during the removal process; and~~

~~(iv) Presentation of evidence and witnesses in his or her behalf and responses to allegations.~~

~~(D) The Chancellor or his designee must be present at the hearing.~~

~~(E) The Chairperson shall preside over the proceedings.~~

~~(F) If the Chairperson is the officer facing charges, the Vice-Chairperson shall preside over the proceedings.~~

~~(G) A two-thirds majority of the voting representatives (excluding the accused officer) will be required to remove an officer.~~

Commented [ZL6]: Former sections VI and VII are procedural and are being moved to the bylaws.

SECTION IV: PARLIAMENTARY PROCEDURE

Deleted: VIII

The most recent edition of *Robert's Rules of Order* will govern the USMSC meetings except when in conflict with this Constitution.

Deleted: Council

SECTION V: AMENDMENT PROCEDURES

Deleted: IX

(A) To amend this Constitution, the following criteria must be met:

1. Any proposed amendment will be presented in a written form at least one meeting prior to the one at which a vote is taken.

2. The proposed amendment must be sent to each member in printed form with notice of the called meeting.

3. The proposed amendment must receive a two-thirds majority of the representatives to be included in the constitution.

(B) Any changes must also be approved by the Chancellor and the Board of Regents of the University System of Maryland.

UNIVERSITY SYSTEM OF MARYLAND STUDENT COUNCIL

CONSTITUTION

(As approved by the Board of Regents, TBD)

SECTION I: MISSION AND PURPOSE

The University System of Maryland Student Council (USMSC) is an apolitical advisory board established to assist the Chancellor. The USMSC derives its authority from the Board of Regents and shall act as a conduit for communication between students and the Chancellor and the Board of Regents. In keeping with its proactive nature, the USMSC will propose new policies and policy changes to both the Chancellor and the Board of Regents, as well as review other proposed policies.

The primary function of the USMSC will be to advise the Chancellor on issues, matters, and policies having direct bearing on students and student affairs of the University of Maryland System (USM) as a whole. In fulfilling this function, the USMSC will transmit to the Chancellor its majority and minority views on behalf of its constituent student bodies.

The USMSC will also function as a network for sharing ideas and concerns of general interest to students and act as resource contacts for student governments on the individual campuses.

SECTION II: STRUCTURE AND REPRESENTATION

A. The USMSC is primarily composed of two Representatives from the following degree-granting USM institutions and regional centers: (1) Bowie State University; (2) Coppin State University; (3) Frostburg State University; (4) Salisbury University; (5) Towson University; (6) University of Baltimore; (7) University of Maryland, Baltimore; (8) University of Maryland, Baltimore County;
   (9) University of Maryland, College Park; (10) University of Maryland, Eastern Shore; (11) University of Maryland, University College; (12) University of Maryland, Center for Environmental Science; (13) Universities at Shady Grove; and (14) USM at Hagerstown.
B. The USMSC Executive Board shall be composed of elected officers limited to: President, Vice President of Graduate Affairs, and Vice President of Undergraduate Affairs.
C. Participants in the USMSC that support the function and mission of various aspects of the USMSC compose the Board of Directors.
D. Ex-Officio members to the USMSC are:
    a. The Student Regent; and
    b. USM System Office Representatives.

SECTION III: MEETINGS

A. A simple majority of the active USM institutions and regional centers, as defined by the Bylaws, will constitute a quorum.
B. An official meeting of the USMSC is one where quorum is met with additional constraints according to the Bylaws.
C. Official meetings of the USMSC will be open to all interested persons, unless a closed session is called during an official meeting.

SECTION IV: PARLIAMENTARY PROCEDURE

The most recent edition of *Robert's Rules of Order* will govern the USMSC meetings except when in conflict with this Constitution.

SECTION V: AMENDMENT PROCEDURES

A. To amend this Constitution, the following criteria must be met:
    a. Any proposed amendment will be presented in a written form to the USMSC at least two weeks prior to the meeting at which a vote is taken.
    b. The proposed amendment must receive a two-thirds majority of the Representatives.
B. Any changes must also be approved by the Chancellor and the Board of Regents of the University System of Maryland.

UNIVERSITY SYSTEM of MARYLAND

BOARD OF REGENTS

SUMMARY OF ITEM FOR ACTION, INFORMATION, OR DISCUSSION

TOPIC: Update: Civic Education and Civic Engagement Efforts

COMMITTEE: Education Policy and Student Life

DATE OF COMMITTEE MEETING: Tuesday, March 5, 2019

SUMMARY: In May 2018, the Board of Regents received the final report of the USM Workgroup on Civic Education and Civic Engagement and accepted the recommendations of that workgroup. The recommendations included:

- Establish a USM Civic Learning and Democratic Engagement Workgroup as an ongoing USM workgroup with responsibility for defining goals and developing and analyzing System-wide progress toward those goals.
- Foster an ethos of civic engagement and participation across all parts of all institutions and through the educational culture.
- Encourage Carnegie Community Engagement classification for all institutions in USM.
- Encourage voting by using the National Study of Learning Voting and Engagement (NSDLV) data to document and assess progress toward higher voter participation from each institution.
- Expand opportunities for civic learning and engagement throughout coursework and through community leadership programs.

USM established the Workgroup and identified four committees to carry out the work: a committee on Carnegie Classification, a committee on curriculum integration, and a committee on voting and census. In addition, we have a steering committee of provosts and vice presidents from all the institutions to serve as key points of contact for the work. A new USM webpage has been established for the USM Civic Education/Civic Engagement work: https://www.usmd.edu/usm/academicaffairs/civic-engagement/.

Subcommittee on Carnegie Classification AY 18-19

- Several USM institutions are preparing applications to receive Carnegie Community Engagement Classification under Towson University's leadership. Towson is one of three Maryland institutions with the classification, and the only USM institution at this time.

Subcommittee on Curriculum Integration AY 18-19

- Reviewed and updated the inventory of activities and partnerships in USM BOR Workgroup Report.
- Identifying opportunities for collaboration and researching best practices.
- Identifying strategies to mitigate gaps within/across USM institutions in civic engagement and civic education.

- Interested in planning a faculty professional development conference for AY19-20; will be seeking support for the conference.

Subcommittee on Voting and Census AY 18-19

- All USM institutions participated in National Voter Registration Day (September 25, 2018).
- Institutions identified successful campus strategies for encouraging voter registration, which included Turbo Vote, student ambassadors, and coalitions between student affairs and academic affairs.
- Professors Stella Rouse and Mike Hammer (UMCP Political Science) met with the subcommittee to share research insights on "identity politics" and election reforms that affect students/millennials who are "digital natives" and possible strategies to reach them and engage them in the electoral process.
- Spring activities include establishing campus activities around the 2020 Census.

ALTERNATIVE(S): This is an information item.

FISCAL IMPACT: This is an information item.

CHANCELLOR'S RECOMMENDATION: This is an information item.

COMMITTEE RECOMMENDATION: Information Only		DATE: March 5, 2019
BOARD ACTION:		DATE:
SUBMITTED BY: Joann A. Boughman	301-445-1992	jboughman@usmd.edu

UNIVERSITY SYSTEM of MARYLAND

BOARD OF REGENTS

SUMMARY OF ITEM FOR ACTION, INFORMATION, OR DISCUSSION

TOPIC: Update: USM P-20 Initiatives

COMMITTEE: Education Policy and Student Life

DATE OF COMMITTEE MEETING: Tuesday, March 5, 2019

SUMMARY: Traditionally we give the Board of Regents an annual update on highlights of USM's P-20 initiatives every spring. The P-20 work in the Office of Academic and Student Affairs encompasses partnerships between USM, USM institutions, community colleges, independent universities, and the Maryland's public schools. The P-20 Office serves as a single point of contact for the education segments from the P-12 schools through community colleges to universities to collaborate on shared objectives of building seamless educational experiences for students from kindergarten through college and career.

MCCE

This year, the work of the P-20 office has expanded with the addition of the new Maryland Center for Computing Education (MCCE). We hired a new program director and a research director in July 2018, and have made progress with organizing the center, outreach to the school districts, and development of summer professional development programs for teachers. In summer 2019, we anticipate providing professional development for over 200 Maryland teachers, while assisting all Maryland school systems develop and implement their plans for making computer science opportunities available to all students in the state.

B-Power

USM continues to work on the B-Power Initiative. John Brenner, Director of Early College Initiatives at the University of Baltimore, has led this work, and has expanded the program again, this year. Dual enrollment headcount at UB has grown twentyfold since 2016, and partner high schools and community-based partners increased tenfold. Growth included the participation of middle school students in the College Readiness Academy for the first time as well. now at the cusp of reaching nearly every eligible public high school in Baltimore with B-Power dual enrollment. Significant steps have been made in establishing a consortium of higher education collaborators. UB and Baltimore City Community College have signed a MOU that ensures that BCCC will give college credit to students who take the dual enrollment courses offered by UB in the Baltimore City Public Schools. In addition, UB is hosting regular meetings that include Coppin and Morgan, in addition to UB, BCCC, and the Baltimore City Public Schools.

Teacher Workforce Workgroup

At the February 2019 meeting of the Council of University System Presidents, Chancellor Caret received approval to establish a workforce workgroup to look at the teacher pipeline. The Kirwan Commission has identified teaching and teachers as critical to improving public education in Maryland,

and USM provides almost 70% of the Maryland-prepared teachers. The Teacher Workforce Workgroup is charged with examining matters of quantity and quality in producing an appropriate teacher workforce for our state and advising System leadership and the Regents on how the USM can best shape its resources in that effort, in anticipation of the FY2021 Enhancement Request. Dr. DeBrenna Agbenyiga, Provost at Bowie State University, and Dr. Laurie Mullen, Dean of Education at Towson University, will co-chair a workgroup composed of all ten USM Education Deans and Directors, USM's Institutional Research office, and augmented by representatives from the Maryland Independent College and University Association, the Maryland Association of Community Colleges, the Maryland State Department of Education, and the Maryland Higher Education Commission.

First in the World Maryland Mathematics Reform Initiative (FITW-MMRI)
USM received a four-year, three-million-dollar grant from the U.S. Department of Education in 2015. The grant directly addresses the problem of too many undergraduate students placing into non-credit developmental and remedial mathematics courses. In collaboration with seven community colleges and five USM institutions, USM has supported the development of a statistics pathway that accelerates students' progress through their general education required mathematics courses. We now have results from the first cohort of students who completed the innovative math pathway, and the outcomes exceeded our expectations. The evaluation of the first cohort of 2000 students in 10 different institutions showed that students in the new pathways courses passed at a higher rate than students in traditional college algebra courses.

ALTERNATIVE(S): This is an information item.

FISCAL IMPACT: This is an information item.

CHANCELLOR'S RECOMMENDATION: This is an information item.

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Maryland Center for Computing Education (MCCE)

The ***MCCE*** is designed to expand access to high-quality Pre-Kindergarten-12 (P-12) computing education by strengthening educator skills and increasing the number of computer science teachers in elementary and secondary education. It also serves as a focal point for broader collaborative initiatives to increase the availability and quality of P-12 computing education across the state, including stakeholder meetings and partnerships; teacher certification efforts; standards and curriculum development; innovative pedagogical research and practices; training and awareness for administrators, students, and parents; and coordinating with related national efforts.
The ***MCCE*** is housed at the University System of Maryland. The long-term vision is for a collaborative Center that has connections with USM campuses, school systems, nonprofits, industrial partners, and other government agencies for a strong public-private partnership. The MCCE Steering and Advisory Committees will include representatives of multiple stakeholders and institutions, to foster a strong community-centered vision.

Building on several national-level computing initiatives (including the White House's CS for All initiative, the NSF-funded Expanding Computing Education Pathways Alliance, and the P-12 Computing Education Framework initiative and working in collaboration with the progress of national computing education projects and partners, Maryland is well-positioned to establish a comprehensive approach to meeting the needs of educators and expanding options for Maryland's future knowledge economy. The centralized infrastructure provided by ***MCCE*** will increase access, equity, and efficiency of computing education.

MCCE Activities

To support the Maryland Computing Education 15-Year Goals, the initial primary focus of the ***MCCE*** is to increase the number of qualified P-12 teachers who teach computational thinking in STEM courses and a full range of computer science courses, leading to multiple postsecondary options in computer science, information technology, and cybersecurity. The ***MCCE*** assists local school systems and other partner organizations to increase student exposure to computing and computational thinking by supporting existing teachers, creating a pool of new computer science teachers, and developing educator supports and resources.

Other key goals and activities include:

- **Collaborative Advocacy.** Providing a focal point for continuing the Maryland CS Education Steering Committee and state-level collaborations to improve standards, curriculum, course availability, teacher preparation, national visibility, and funding support for CS education.
- **Assessing Progress.** Measuring and tracking progress towards the Steering Committee's 15-year goals, leveraging the Maryland Longitudinal Data Center.
- **Increasing Diversity.** Broadening participation by increasing gender, racial, and socioeconomic diversity in computing, as well as increasing accessibility to students with disabilities by providing quality teacher preparation.

- **Developing Quality Content.** Improving P-12 computing curriculum and providing quality teacher preparation.

Guidelines per House Bill 281:

Expand access to computer science education

- "The purpose of the Center is to **expand access** to high-quality computer science education in grades prekindergarten through 12 by strengthening the skills of educators and **increasing the number of computer science teachers** in elementary and secondary education."
    - Explanatory note: Both 'expanding access' and 'increasing the number of teachers' are necessarily and definitionally additive; that is, the Center must build on top of what is already present in terms of student access to CS education and number of CS teachers, not what is already present.
- "The Center shall provide professional development and programs to **broaden** and sustain the pool of teachers needed to achieve the requirements of §4-111.4 of this article." (§4-111.4 contains the requirements for county boards, not for the MCCE)
    - Explanatory note: "broaden" is necessarily additive; otherwise, "maintain" or some other synonym would have been used.
- "The [Maryland State Computer Science Education] Plan shall identify: (I) Specific actions, resources, metrics, and benchmarks to **create** a long-term sustainable pipeline of computer science teachers"

Provide equitable access to computer science education:

- "In developing the [Maryland State Computer Science Education] Plan, the Center shall place **priority on** reaching **school districts with high poverty and large rural areas** and **student populations that are underrepresented in computer science fields**."
- In administering the grant program, the Center must "**prioritize applications** that focus on serving: (A.) areas with **high poverty**; (B.) **rural areas**; or (C.) areas with **large minority...or other demographic groups that are underrepresented** in the field of computer science"

Regional Partners

Regional university partners are encouraged to apply for grants to develop preservice programs, and provide local professional development opportunities.

How do the public school districts need support?

1. Content knowledge experts to review curriculum and identify materials to meet Maryland computer science state standards.
2. Professional development and collaboration opportunities for in-service teachers
3. Summer camps that contribute to teacher capacity as well as opportunities for students.
4. Preservice programs including either: secondary computer science primary or add on certification, methods courses covering how to teach computer science effectively or . K-8 computational thinking integration.