



## Establish a Post-Baccalaureate Certificate in Science, Technology, and Innovation Policy (PCC 21056)

**PRESENTED BY** Valérie Orlando, Chair, Senate Programs, Curricula, and Courses Committee

**REVIEW DATES** SEC – January 25, 2022 | SENATE – February 9, 2022

**VOTING METHOD** In a single vote

**RELEVANT  
POLICY/DOCUMENT**

**NECESSARY  
APPROVALS** Senate, President, University System of Maryland Chancellor, and Maryland Higher Education Commission

### ISSUE

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The Maryland School of Public Policy (the School) proposes to establish a Post-Baccalaureate Certificate in Science, Technology, and Innovation Policy. The proposed certificate will provide the knowledge and skills necessary to understand, analyze, and implement policies related to science, technology, and innovation, including regulatory aspects related to new technologies and approaches for creating and commercializing new technologies and innovations. Advances in science and technology are essential for new industries and jobs, for maintaining national defense, for ensuring energy security, for expanding food supplies, and for improving healthcare. Science, technology, and innovation (STI) policy therefore figures centrally in the minds of decision-makers, from the highest levels of national governments to the corridors of city halls. The certificate is aimed towards students with STEM backgrounds who wish to acquire a deeper understanding and appreciation of the social and political processes that shape science and technology, and to students in public policy related majors who recognize that many issues are reliant on – and shaped – by science and technological advances.

This twelve-credit program will be offered on campus and through online delivery. The program will have the following requirements:

- PLCY688J Concepts of Technology Change and Innovation (3 Credits)
- PLCY689L Influence of Science on Policy and Policy on Science (3 Credits)
- PLCY699B Modernizing the Energy System (3 Credits) or PLCY688C Cyberspace: Legal and Policy Implications (3 Credits)
- Relevant Elective Course (3 Credits)

Students who complete the program will gain quantitative skills for analyzing empirical data related to science and technology change and analytical skills for designing and evaluating STI policies and programs. Students will learn to use STI policy documents and processes, including Congressional hearings, statutes, federal budgets, court decisions, National Research Council reports, and studies from advocacy groups. Students will also develop their communication skills by writing policy memos, preparing Congressional testimony, and making presentations.

The School currently offers a Master of Public Management as well as other graduate certificate programs. Each of the courses required for the proposed program has been offered before. Tuition revenue will be used to cover administrative costs and the cost of the new courses for the program.

This proposal was approved by the Graduate School Programs, Curricula, and Courses committee on November 29, 2021, and the Senate Programs, Curricula, and Courses committee on December 3, 2021.

## **RECOMMENDATION**

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The Senate Committee on Programs, Curricula, and Courses recommends that the Senate approve this new certificate program.

## **COMMITTEE WORK**

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The committee considered this proposal at its meeting on December 3, 2021. Anand Patwardhan and Tom Kennedy from the Maryland School of Public Policy presented the proposal and answered questions from the committee. The proposal was approved by the committee.

## **ALTERNATIVES**

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The Senate could decline to approve this new certificate program.

## **RISKS**

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If the Senate declines to approve this certificate program, the university will lose an opportunity to establish a certificate program that will train students in a needed area of policy expertise by using courses that have already been developed and offered by the School.

## **FINANCIAL IMPLICATIONS**

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Because this program is self-supported, there are no significant financial implications for this proposal.

# 823: SCIENCE, TECHNOLOGY, AND INNOVATION POLICY

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## In Workflow

1. PLCY PCC Chair (nharris@umd.edu; pgjoyce@umd.edu; eduke1@umd.edu)
2. PLCY Dean (pgjoyce@umd.edu; rorr1@umd.edu)
3. Academic Affairs Curriculum Manager (mcolson@umd.edu)
4. Graduate School Curriculum Manager (aambrosi@umd.edu)
5. Graduate PCC Chair (aambrosi@umd.edu)
6. Dean of the Graduate School (sfetter@umd.edu; aambrosi@umd.edu)
7. Senate PCC Chair (mcolson@umd.edu; vorlando@umd.edu)
8. University Senate Chair (mcolson@umd.edu)
9. President (mcolson@umd.edu)
10. Chancellor (mcolson@umd.edu)
11. MHEC (mcolson@umd.edu)
12. Provost Office (mcolson@umd.edu)
13. Graduate Catalog Manager (aambrosi@umd.edu)

## Approval Path

1. Fri, 12 Nov 2021 16:09:37 GMT  
Elizabeth Duke (eduke1): Approved for PLCY PCC Chair
2. Fri, 12 Nov 2021 16:26:41 GMT  
Robert Orr (rorr1): Approved for PLCY Dean
3. Tue, 16 Nov 2021 21:55:57 GMT  
Michael Colson (mcolson): Approved for Academic Affairs Curriculum Manager
4. Fri, 17 Dec 2021 13:24:00 GMT  
Angela Ambrosi (aambrosi): Approved for Graduate School Curriculum Manager
5. Fri, 17 Dec 2021 13:24:25 GMT  
Angela Ambrosi (aambrosi): Approved for Graduate PCC Chair
6. Sat, 18 Dec 2021 19:28:35 GMT  
Steve Fetter (sfetter): Approved for Dean of the Graduate School
7. Mon, 20 Dec 2021 14:44:35 GMT  
Valerie Orlando (vorlando): Approved for Senate PCC Chair

## New Program Proposal

Date Submitted: Fri, 12 Nov 2021 14:18:51 GMT

## Viewing: 823 : Science, Technology, and Innovation Policy

Last edit: Thu, 02 Dec 2021 18:43:58 GMT

Changes proposed by: Thomas Kennedy (tkennedy)

### Program Name

Science, Technology, and Innovation Policy

### Program Status

Proposed

### Effective Term

Fall 2022

### Catalog Year

2022-2023

### Program Level

Graduate Program

### Program Type

Post-Baccalaureate Certificate

**Delivery Method**

On Campus

**Departments****Department**

Public Policy

**Colleges****College**

Public Policy

**Degree(s) Awarded****Degree Awarded**

Certificate, Post-Baccalaureate

**Proposal Contact**

Tom Kennedy, Nina Harris, Phil Joyce

**Proposal Summary**

The School of Public Policy proposes to create a new graduate certificate program in Science, Technology and Innovation Policy. The certificate program will be a four-course (twelve credit) program of study. The program is expected to attract a diverse student body – including mid-career professionals from public and government agencies at the national and state level, multinational organizations, and relevant private sector and civil society organizations; as well as students currently in the MPP and MPM programs at the School of Public Policy and graduate students in STEM programs at UMD. The curriculum will provide the knowledge and skills necessary to understand, analyze and implement policies related to science, technology and innovation, including regulatory aspects related to new technologies and approaches for creating and commercializing new technologies and innovations. This program will work in and across a range of science and technology domains such as information & communication technology and energy & environmental technology.

(PCC Log Number 21056)

**Program and Catalog Information**

**Provide the catalog description of the proposed program. As part of the description, please indicate any areas of concentration or specializations that will be offered.**

The Graduate Certificate in Science, Technology and Innovation Policy is a four-course (twelve credit) program of study designed for mid-career professionals from public agencies, multinational organizations and relevant private and civil society organizations; as well as graduate students at UMD. The curriculum provides the knowledge and skills necessary to understand, analyze and implement policies related to science, technology and innovation, including regulatory aspects related to new technologies and approaches for creating and commercializing new technologies and innovations. This program works in and across a range of science and technology domains such as information & communication technology and energy & environmental technology.

**Catalog Program Requirements:**

Course	Title	Credits
<b>Core Requirements</b>		
PLCY688	Topics in Public Policy (PLCY688J Concepts of Technology Change and Innovation)	3
PLCY689	Public Policy Topics (PLCY689L Influence of Science on Policy and Policy on Science)	3
One of the following technology domain courses:		3
PLCY699	Selected Topics Public Policy (PLCY699B Modernizing the Energy System)	
PLCY688	Topics in Public Policy (PLCY688C Cyberspace: Legal and Policy Implications)	
<b>Elective</b>		<b>3</b>
Any relevant course approved by the program advisor.		
<b>Total Credits</b>		<b>12</b>

\*\*\*\*\*The information below is for proposal purposes and will not appear in the Academic Catalog\*\*\*\*\*

The proposed Graduate Certificate will consist of four, three-credit courses (12 graduate academic credits). To earn their certificate, students would: Complete the following two three-credit courses:

1. PLCY 688J: Concepts of Technology Change and Innovation
2. PLCY 689L: Influence of Science on Policy and Policy on Science

Recognizing that in practice, science, technology and innovation policy often addresses the needs and challenges in specific technology domains, students will be expected to identify and select a particular technology domain in which to develop and apply skills and concepts – and select the third required course from the selected domain. Initially, we expect that students would choose between the following domain options:

- A) Information & communication technology (ICT), including cybersecurity and cyberpolicy
- B) Energy technologies, particularly clean and sustainable energy technologies

Accordingly, students will need to choose one three-credit course from the following:

1. PLCY 699B: Modernizing the Energy System
2. PLCY 688C: Cyberspace: Legal and Policy Implications

Other science and technology domains may be added in future – such as health-care technologies, biotechnology, and security technologies. When domains and courses are added at PLCY they may be added to this certificate; courses from other departments are not to be included.

The fourth course will be an open elective three-credit course that students may choose from the following list:

- PLCY 798K: Integrated Modeling for Policy
- PLCY 780C: Science, Technology, and International Security
- PLCY XXX: Modeling Strategic Cybersecurity Risk in Critical Infrastructure
- PLCY 689K: Decision Analysis
- ENME 701: Sustainable Energy Conversion and the Environment
- ENES 663: Strategies for Managing Innovation
- ENCE 673: Urban transportation
- ENPM 624: Renewable energy applications
- BISI 708X: Advanced Topics in Biological Sciences: Scholarly Communication and Public Engagement

Other relevant electives that may be developed and approved by faculty that will enhance the certificate program.

**Sample plan. Provide a term by term sample plan that shows how a hypothetical student would progress through the program to completion. It should be clear the length of time it will take for a typical student to graduate. For undergraduate programs, this should be the four-year plan.**

The STI Certificate will be offered in a traditional semester format. Students will have the option to study full-time or part-time. Full-time students will mostly take two courses per Fall and Spring term and part-time students will mostly take one course per Fall and Spring term. The certificate may be offered in non-traditional format if desired by a partner organization.

#### **Full-Time Track**

Fall (Year 1)

- PLCY 688J: Concepts of Technology Change and Innovation
- PLCY 689L: Influence of Science on Policy and Policy on Science

Spring (Year 1)

- PLCY 699B: Modernizing the Energy System
- PLCY 798K: Integrated Modeling for Policy

#### **Part-Time Track**

Fall (Year 1)

- PLCY 688J: Concepts of Technology Change and Innovation
- Spring (Year 1)

- PLCY 689L: Influence of Science on Policy and Policy on Science

Fall (Year 2)

- PLCY 699B: Modernizing the Energy System
- Spring (Year 2)

- PLCY 798K: Integrated Modeling for Policy

List the intended student learning outcomes. In an attachment, provide the plan for assessing these outcomes.

### Learning Outcomes

Learning Outcome 1: Students will understand the principles and practices of science, technology and innovation policy

Learning Outcome 2: Students will be able to understand the design and implementation of policies targeting science, technology and innovation outcomes in specific science & technology domains – and how these outcomes can advance broader policy goals

Learning Outcome 3: Students will gain practical skills related to analysis, effective communication and transdisciplinary and interdisciplinary approaches towards complex problems

The plan for assessing these outcomes is included as Attachment B.

## New Program Information

### Mission and Purpose

Describe the program and explain how it fits the institutional mission statement and planning priorities.

Science and technology have been recognized as key enablers for economic growth and sustainable development and its security remains an enduring challenge. The ability to foster, stimulate, and secure an innovation-based economy is accepted as an important determinant of national competitiveness and strength and for achieving social and developmental goals. Advances in science and technology are essential for new industries and jobs; for maintaining national defense; for ensuring energy security; for expanding food supplies; and for improving healthcare. Science, technology and innovation (STI) policy therefore figures centrally in the minds of decision-makers, from the highest levels of national governments to the corridors of city halls. STI policy deals with the promotion of science and the development and commercialization of technology – often through entrepreneurship and new venture creation. At the same time, STI policy also addresses the actual and potential side effects of advanced technologies – effects on health, the environment, privacy, and many other aspects of our lives. Science and technology policy is focused on taking advantage of the enormous benefits to society while minimizing the costs.

### Program Characteristics

What are the educational objectives of the program?

The graduate certificate aims at developing a deep understanding of key concepts related to STI policy; including policies for science and science for policy; providing a range of perspectives on political, institutional, social and market factors affecting science and technology, and equipping students with essential skills for analysis and communication.

The certificate is aimed towards both students with STEM backgrounds who wish to acquire a deeper understanding and appreciation of the social and political processes that shape science & technology, and to students in public policy related majors who recognize that many issues are reliant on – and shaped – by science and technological advances. Governing the interplay between these issues and society is an enduring challenge for policy makers who are often woefully unprepared for the complex technical, normative, economic, and political outcomes these issues generate. The STI certificate aims to integrate science, technology, and policy concepts to provide a solid foundation for students interested in this domain.

Specific policy-relevant learning outcomes include:

- Quantitative skills for analyzing empirical data related to technology and technology change
- Analytical skills for designing and evaluating STI policies and programs, including innovation support mechanisms, and regulatory approaches aimed at addressing the social, environmental and other spillovers of new technologies
- Exposure to the main types of STI policy documents and processes, including Congressional hearings, statutes, federal budgets, court decisions, National Research Council reports, and studies from advocacy groups.
- Communication skills in writing policy memos, preparing Congressional testimony, and making presentations.

Describe any selective admissions policy or special criteria for students interested in this program.

Admission policies will be those of the Graduate School of the University of Maryland. Students will be expected to have some prior exposure to quantitative methods, particularly basic statistics and data analysis. There will be no other special criteria for students interested in the program. The admission criteria of the Graduate School include:

- Applicants should have earned a four-year baccalaureate degree or equivalent from an accredited institution.
- Applicants should have a minimum cumulative 3.0GPA (on a 4.0 scale). Official transcripts of a post-secondary degree and a resume are required along with the application.
- International applicants must meet all requirements for international admission, which have specific standards for academic credentials, language proficiency, financial support, visa requirements, etc. Refer to <http://gradschool.umd.edu/admissions/international-admissions> for process and requirements.

As required by the Graduate School, all application materials are to be submitted electronically:

- Graduate Application
- College or University Transcripts
- Statement of Purpose

- Letters of Recommendation
- Program Supporting Documents
- Non-refundable Application Fee

Completed applications will be reviewed by a School admissions committee. The recommendations of the committee will be submitted to the Dean of the Graduate School who will make the final admission decision.

**Summarize the factors that were considered in developing the proposed curriculum (such as recommendations of advisory or other groups, articulated workforce needs, standards set by disciplinary associations or specialized-accrediting groups, etc.).**

The program has been developed through an intensive consultative process involving the School's faculty. The School faculty includes tenured, tenure-track, and professional track faculty, characterized by a combination of extensive research credentials combined with practical experience at the highest leadership levels in government such that the School is consistently ranked among the best nationally. The proposed program is well aligned with the mission and activities of research centers within the School such as the Center for Global Sustainability (CGS) and the new Center for Governance of Technology and Systems (GoTech). In addition, program development has had the benefit of inputs from the School's Office of Executive Programs that has extensive experience with addressing the needs of career professionals at the national, state and local levels and private organizations.

**Select the academic calendar type for this program (calendar types with dates can be found on the Academic Calendar (<https://www.provost.umd.edu/calendar/>) page)**

Traditional Semester

**Identify specific actions and strategies that will be utilized to recruit and retain a diverse student body.**

The STI Certificate will seek to recruit and retain a diverse student body in largely the same manner that the School of Public Policy currently utilizes for its existing graduate degree and certificate programs. Specific strategies and actions are included as Attachment E.

## Relationship to Other Units or Institutions

**If a required or recommended course is offered by another department, discuss how the additional students will not unduly burden that department's faculty and resources. Discuss any other potential impacts on another department, such as academic content that may significantly overlap with existing programs. Use space below for any comments. Otherwise, attach supporting correspondence.**

No required course is offered by another department and there is anticipated to be no significant overlap in academic content with any existing programs.

**Accreditation and Licensure. Will the program need to be accredited? If so, indicate the accrediting agency. Also, indicate if students will expect to be licensed or certified in order to engage in or be successful in the program's target occupation.**

The program is not subject to accreditation. The STI Certificate will, however, meet the same standards and adhere to the same principles as the other certificate programs run by the Graduate School and the School of Public Policy. Students will not be expected to be licensed or certified in order to engage in or be successful in the program's targeted occupations.

**Describe any cooperative arrangements with other institutions or organizations that will be important for the success of this program.**

Cooperative agreements with other institutions or organizations will not be necessary for the success of this program. Such agreements, however, may be struck in order to grow the size of the program over time. For example, a partnership with a U.S. federal government agency may be struck to serve as a pipeline for admissible employees of the agency to enroll in the certificate.

## Faculty and Organization

**Who will provide academic direction and oversight for the program? In an attachment, please indicate the faculty involved in the program. Include their titles, credentials, and courses they may teach for the program.**

Academic direction and oversight will be provided by Professor Anand Patwardhan and Dr. Charles Harry who will serve as Co-Program Directors. An Advisory committee will be established for providing further strategic and operational advice and support to the program. This committee will consist of members of the School's tenure track and professional track faculty including Prof Rosina Bierbaum and Dr Leon Clarke, Director of Executive Programs Thomas Kennedy and faculty colleagues from other units on campus working in relevant areas, such as Prof Ellen Williams and Prof Karen Lips.

Attachment C lists involved faculty, with credentials and courses they may teach.

**Indicate who will provide the administrative coordination for the program**

The program will be administered and managed by the Office of Executive Programs (OEP) at the School of Public Policy. The program will also form an STI Certificate Advisory Committee (as described above) that will provide guidance on the running of the program as well as strategic advice regarding future opportunities for the program



## Resource Needs and Sources

**Each new program is required to have a library assessment prepared by the University Libraries in order to determine any new library resources that may be required. This assessment must be done by the University Libraries. Add as an attachment.**

The library assessment is attached.

**Discuss the adequacy of physical facilities, infrastructure and instructional equipment.**

The use of physical facilities, infrastructure and instructional equipment for the STI Certificate will be the same as for the School's other certificate and degree programs; no new space or equipment will be needed (although a contingency amount for equipment has been provided for in the program budget).

**Discuss the instructional resources (faculty, staff, and teaching assistants) that will be needed to cover new courses or needed additional sections of existing courses to be taught. Indicate the source of resources for covering these costs.**

The program will utilize a cadre of both full-time MSPP faculty and lecturers and adjunct lecturers for the classes. In most cases, faculty utilized will have taught within the School's traditional degree and/or executive programs. Tuition revenue will be used to cover all instructional needs and all other program expenses (including salaries, benefits, program materials). All students will pay all associated mandatory fees and the graduate application fee. If a cohort were to run an unplanned loss, we would cover it with net revenues from our many other successful entrepreneurial programs. This self-support program will have no impact on the School's traditional programs.

**Discuss the administrative and advising resources that will be needed for the program. Indicate the source of resources for covering these costs.**

The SPP Associate Dean and the STI Co-Program Directors, along with the leadership of the School's OEP, will play the major management roles for the program. The School's OEP has many years of experience supporting the School's MPS in Public Administration, Executive Master of Public Management, Graduate Certificate programs, and noncredit trainings. Advising will be supervised by the MSPP Associate Dean and the STI Co-Program Directors. Tuition revenue will cover the cost of these resources.

**Use the Maryland Higher Education Commission (MHEC) commission financial tables to describe the program's financial plan for the next five years. See help bubble for financial table template. Use space below for any additional comments on program funding.**

The financial plan is attached. We anticipate the program will draw 20 students into the program annually. The program, however, breaks even financially at 9 students.

## Implications for the State (Additional Information Required by MHEC and the Board of Regents)

**Explain how there is a compelling regional or statewide need for the program. Argument for need may be based on the need for the advancement of knowledge and/or societal needs, including the need for "expanding educational opportunities and choices for minority and educationally disadvantaged students at institutions of higher education." Also, explain how need is consistent with the Maryland State Plan for Postsecondary Education (<https://mhec.state.md.us/About/Documents/2017.2021%20Maryland%20State%20Plan%20for%20Higher%20Education.pdf>).**

Innovation has been recognized as a key element of Maryland's growth strategy, as reflected in support for new ventures, academia - industry partnerships, and early-stage innovation funding. The proposed program will help advance the innovation agenda by creating the capacity within the policy community to design and manage policies and mechanisms to support technology and innovation. It will effectively complement the deep STEM capabilities in Maryland institutions (including UMCP) with an understanding of social, economic and political issues and processes relevant both for technology regulation and technology promotion.

**Is the proposed Post-Baccalaureate Certificate derived entirely from the core requirements of an existing master's degree program?**

No

**Present data and analysis projecting market demand and the availability of openings in a job market to be served by the new program. Possible sources of information include industry or disciplinary studies on job market, the USBLS Occupational Outlook Handbook (<https://www.bls.gov/ooh/>), or Maryland state Occupational and Industry Projections (<http://www.dlr.state.md.us/lmi/iandoproj/>) over the next five years. Also, provide information on the existing supply of graduates in similar programs in the state (use MHEC's Office of Research and Policy Analysis webpage (<http://mhec.maryland.gov/publications/Pages/research/>) for Annual Reports on Enrollment by Program) and discuss how future demand for graduates will exceed the existing supply. As part of this analysis, indicate the anticipated number of students your program will graduate per year at steady state.**

According to the USBLS Occupational Outlook Handbook, there are over 1 million jobs in the field, with jobs in the management analysis area growing faster than average (at 14%) and in the health services field growing much faster than average (at 32%). According to the Maryland Occupational and Industry Projections there are over 30,000 jobs, with the same 14% and 32% growth rates cited above. There do not appear to be graduates of similar programs in the state currently. At steady state, this program will graduate 20 students per year. Please see attachment for additional detail.

**Identify similar programs in the state. Discuss any differences between the proposed program and existing programs. Explain how your program will not result in an unreasonable duplication of an existing program (you can base this argument on program differences or market demand for graduates). The MHEC website can be used to find academic programs operating in the state: [http://mhec.maryland.gov/institutions\\_training/pages/HEPrograms.aspx](http://mhec.maryland.gov/institutions_training/pages/HEPrograms.aspx)**

There are no comparable programs at State of Maryland System institutions.



**Discuss the possible impact on Historically Black Institutions (HBIs) in the state. Will the program affect any existing programs at Maryland HBIs? Will the program impact the uniqueness or identity of a Maryland HBI?**

There are no existing similar programs at Maryland HBIs and there should be no impact on HBIs in the state.

## **Supporting Documents**

### **Attachments**

Science, Technology and Innovation Policy Budget.xls  
Market Research Science and Tech.xlsx  
Market Employment Projections Science and Tech.xlsx  
Library Assessment.docx  
STI Certificate Appendix A-D 11-12.docx

Key: 823

## School of Public Policy

### Science, Technology and Innovation Policy, PS-GC, Fall 2022

[This program is self-support. Instructors may not teach on-load and administrators must be paid through revenue generated by the program]

Estimated Tuition Revenue	Year 1	Year 2	Year 3	Year 4	Year 5
<b>A. Total # of students per year</b>	9	10	11	12	13
<b>B. Total Courses per year</b>	4	4	4	4	4
<b>C. Graduate Tuition Per Course; Assumes 5% increase</b>	\$3,500	\$3,675	\$3,859	\$4,052	\$4,254
<b>Total Estimated Tuition Revenue</b>	<b>\$126,000</b>	<b>\$147,000</b>	<b>\$169,785</b>	<b>\$194,481</b>	<b>\$221,222</b>
Estimated Instructional Expenses	Year 1	Year 2	Year 3	Year 4	Year 5
<b>A. Instructor Salaries and Benefits Total</b>	<b>\$46,548</b>	<b>\$47,479</b>	<b>\$48,429</b>	<b>\$49,397</b>	<b>\$50,385</b>
1. Subtotal: 4-course salaries (assumes 2% annual increase)	\$36,000	\$36,720	\$37,454	\$38,203	\$38,968
a. Average instructor salary per course	9,000	9,180	9,364	9,551	9,742
b. Total # of courses taught per year	4	4	4	4	4
2. Benefits: 29.3%	\$10,548	\$10,759	\$10,974	\$11,194	\$11,417
<b>B. Grader Salaries and Benefits</b>	<b>\$14,916</b>	<b>\$15,214</b>	<b>\$15,519</b>	<b>\$15,829</b>	<b>\$16,146</b>
1. Subtotal: Salary (assumes 2% annual increase)	\$12,000	\$12,240	\$12,485	\$12,734	\$12,989
a. Average grader stipened per course	3,000	3,060	3,121	3,184	3,247
b. Total # of courses	4	4	4	4	4
2. Benefits: 24.3%	\$2,916	\$2,974	\$3,034	\$3,094	\$3,156
<b>Total Instructional Expenses</b>	<b>\$61,464</b>	<b>\$62,693</b>	<b>\$63,947</b>	<b>\$65,226</b>	<b>\$66,531</b>

<b>Total Estimated Tuition Revenue</b>	\$126,000	\$147,000	\$169,785	\$194,481	\$221,222
<b>Total Instructional Expenses</b>	\$61,464	\$62,693	\$63,947	\$65,226	\$66,531
<b>Total OES Administrative Fee (10% Tuition Revenue)</b>	\$12,600	\$14,700	\$16,979	\$19,448	\$22,122
<b>Total Graduate School Administrative Fee</b>	\$1,080	\$1,200	\$1,320	\$1,440	\$1,560
1. Fee assessed per each semester	\$60	\$60	\$60	\$60	\$60
2. Total # of semesters per year	2	2	2	2	2
3. Total number of students per year	9	10	11	12	13
<b>Total Distributable Revenue</b>	<b>\$50,856</b>	<b>\$68,407</b>	<b>\$87,539</b>	<b>\$108,367</b>	<b>\$131,009</b>

### Other Program Expenses to Be Covered by Net Revenue Distribution

Categories of Other Program Expenses (estimated)	Year 1	Year 2	Year 3	Year 4	Year 5
<b>Academic Administration Totals</b>	<b>\$40,620</b>	<b>\$41,432</b>	<b>\$42,261</b>	<b>\$43,106</b>	<b>\$43,968</b>
1. Total Academic Admin Salary (assumes 2% increase)	30,000	30,600	31,212	31,836	32,473
a. Academic Director	30,000	30,600	31,212	31,836	32,473
2. Benefits: Total (35.4%)	10,620	10,832	11,049	11,270	11,495
<b>Materials &amp; Supplies</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
1. Cost per course (estimated)	\$0	\$0	\$0	\$0	\$0
2. Total number of courses	0	0	0	0	0
3. Total number of students	0	0	0	0	0
<b>Marketing &amp; Website</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
1. Marketing	0	0	0	0	0
2. Website	0	0	0	0	0

<b>Equipment</b>	<b>\$1,200</b>	<b>\$0</b>	<b>\$0</b>	<b>\$1,200</b>	<b>\$0</b>
1. Laptops / Monitors	1,000	0	0	1,000	0
2. Printers	200	0	0	200	0
3. Other Devices	0	0	0	0	0
<b>Other Operational Expenses</b>	<b>\$4,000</b>	<b>\$4,000</b>	<b>\$4,000</b>	<b>\$4,000</b>	<b>\$4,000</b>
1. Travel (for recruitment)	3,000	3,000	3,000	3,000	3,000
2. Graduation-related	500	500	500	500	500
3. Other	500	500	500	500	500
<b>Courses: Development &amp; Design</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>
1. New Course: Per course instructor stipend	0	0	0	0	0
2. Ttl # of new courses	0	0	0		0
<b>Total Other Estimated Program Expenses</b>	<b>\$45,820</b>	<b>\$45,432</b>	<b>\$46,261</b>	<b>\$48,306</b>	<b>\$47,968</b>

<b>Net Revenue &amp; Non-Instructional Expenses</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
<b>Net Revenue for Distribution</b>	\$50,856	\$68,407	\$87,539	\$108,367	\$131,009
<b>Other Program Expenses</b>	\$45,820	\$45,432	\$46,261	\$48,306	\$47,968
<b>Profit</b>	<b>\$5,036</b>	<b>\$22,974</b>	<b>\$41,278</b>	<b>\$60,061</b>	<b>\$83,041</b>

OES In-House Market Research: Other Institution Comparison

Program Name = Science, Technology, and Innovation Policy, GC

Institution	Website	Delivery Method	Degree Name & Type (MPS, MA, MS, MPH, etc.)	# of Credits	Tuition (course or credit)		Target Population	Prior Education/ Pre-Requisites
					Resident	Non-Resident		
<b>Big Ten Institutions</b>								
University of Minnesota Twin Cities	<a href="https://www.hhh.umn.edu/masters-programs/graduate-minors-and-dual-degrees">https://www.hhh.umn.edu/masters-programs/graduate-minors-and-dual-degrees</a>	F2F	Science, Technology, and Environmental Policy, Graduate Minor	12 credits	\$1,487/credit	\$2,301/credit	Designed for currently enrolled graduate students.  The graduate minor in Science, Technology, and Environmental Policy (STEP) provides students with the skills and knowledge to study public issues arising at the intersection of science, technology, environment, and society that shape economic development, environmental sustainability, human health, and wellbeing. Students choose from the following focus areas: energy and environmental policy; water policy; climate change policy; emerging technologies and society; urban infrastructure systems; or urban agriculture and food systems policy.	Must be a currently enrolled graduate student. Specific coursework is chosen in consultation with the student's minor advisor or director of graduate studies for the associated degree program.
Rutgers University New Brunswick	<a href="https://mbs.rutgers.edu/certificate-science-and-technology-management">https://mbs.rutgers.edu/certificate-science-and-technology-management</a>	F2F	Science and Technology Management, GC	19 credits	\$1,051/credit	\$1,780/credit	Provides business and business-oriented courses intended to supplement training in a science, mathematics, or engineering degree.  Students currently enrolled in graduate programs in science, mathematics, and engineering are eligible to apply for the certificate and will be awarded the certificate upon completion of the 19 credits. Students who already possess a graduate degree in science, mathematics, or engineering may also apply independently for the certificate program. Individuals who have worked in industry for at least five years are eligible to apply for the certificate program as part-time students.	Bachelor's degree from a regionally accredited college or university with minimum 3.0 undergraduate GPA
University of Wisconsin-Madison	<a href="https://business.wisc.edu/graduate-certificates/strategic-innovation/">https://business.wisc.edu/graduate-certificates/strategic-innovation/</a>	F2F	Strategic Innovation: Organizations, Technology, and Society, GC	12 credits	\$1,642/credit	\$3,120/credit	The certificate is available to all UW-Madison graduate-degree-seeking students (excluding University Special students).  Students gain knowledge and skills, equipping them to anticipate major societal shifts affecting the value of innovation, including technological evolution; choose among different innovative projects; understand product development processes within established organizations; and anticipate the social consequences of organizational innovation.	Must be a currently enrolled graduate student.
<b>State of Maryland System Institutions: Overseen by MHEC (<a href="http://mhec.maryland.gov/publications/Pages/research/index.aspx">http://mhec.maryland.gov/publications/Pages/research/index.aspx</a>)</b>								
<b>No Comparable Programs</b>								
<b>Colleges &amp; Universities in the Washington DC - Baltimore MD area</b>								
George Washington University	<a href="https://business.gwu.edu/academics/programs/certificate/graduate-certificate-management-technology-innovation">https://business.gwu.edu/academics/programs/certificate/graduate-certificate-management-technology-innovation</a>	F2F	Management of Technology and Innovation, GC	12 credits	\$1,825/credit		Focuses on organizational management and innovation/entrepreneurship processes. Students will explore broad technology strategies not only to maximize business applications, but also to launch and build new ventures.	Current GWSB Graduate Students: All current students in good academic standing (cumulative GPA of 3.0 or higher) enrolled in a graduate degree program within the GW School of Business (GWSB) are eligible to be considered for admission to a graduate certificate program after one full semester of completed coursework.  Non- GWSB Students: Applicants must hold a bachelor's degree from a regionally accredited college or university.
Virginia Tech	<a href="https://liberalarts.vt.edu/academics/graduate-programs/graduate-certificates/science-and-technology-studies-graduate-certificate.html">https://liberalarts.vt.edu/academics/graduate-programs/graduate-certificates/science-and-technology-studies-graduate-certificate.html</a>	Blended	Science and Technology, GC	12 credits	\$783/credit	\$1,578/credit	The STS graduate certificate offers the opportunity to learn and develop competency in various aspects of the relations between science, technology, and society. It is intended to serve both current graduate students in other programs at Virginia Tech and non-degree-seeking students interested in career advancement.	Bachelor's degree from a regionally accredited college or university with minimum 3.0 undergraduate GPA
<b>Other Major Institutions Offering Similar Programs</b>								
Arizona State University	<a href="https://sfs.asu.edu/degree-programs/grad-cert/rioses/">https://sfs.asu.edu/degree-programs/grad-cert/rioses/</a>	F2F	Responsible Innovation in Science, Engineering, and Society, GC	15 credits	\$837/credit	\$1,308/credit	The certificate program in responsible innovation in science, engineering and society is designed for scientists, engineers, research managers, technology officers, public administrators and policy officials who seek to advance science and technology to improve societal outcomes and to develop creative solutions to the fundamental global challenges of the 21st century.	Bachelor's degree from a regionally accredited college or university with minimum 3.0 undergraduate GPA

Courses completed as a non-degree student are not eligible for application towards the certificate requirements.

## OES In-House Market Research: Projected Enrollment Information

**Program Name = Science, Technology, and Innovation Policy, GC**

Occupation	# of Jobs in the Field	Where Professionals are Employed	Professional Salary Information	Projected Job Growth
<b>Information from U.S. Bureau of Labor Statistics' Occupational Outlook Handbook</b>				
Management Analysts	907,600	Professional, scientific, and technical services- 31% Government- 17% Self-Employed workers- 16% Finance and Insurance- 13% Management of companies and enterprises- 5%	\$87,660/year	14% (Faster than average)
Medical and Health Services Managers	139,600	Hospitals; state, local, and private-33% Offices of physicians-12% Nursing and residential care facilities-10% Government-9% Outpatient care centers-7%	\$104,280/year	32% (Much faster than average)
<b>Information from State of Maryland's Occupational and Industry Projections</b>				
Management Analysts	19,790	Professional, scientific, and technical services- 31% Government- 17% Self-Employed workers- 16% Finance and Insurance- 13% Management of companies and enterprises- 5%	\$102,850	14% (Faster than average)
Medical and Health Services Managers	10,450	Hospitals; state, local, and private-33% Offices of physicians-12% Nursing and residential care facilities-10% Government-9% Outpatient care centers-7%	\$132,000	32% (Much faster than average)

DATE: November 4, 2021

TO: Thomas Kennedy, Director, Executive & Cohort Programs  
Nina Harris, Associate Dean, Academic Programs and Student Services; Clinical Professor  
Philip Joyce, Professor and Senior Associate Dean

FROM: On behalf of the University of Maryland Libraries:  
  
Judy Markowitz, Librarian for Government and Politics, Public Policy, Women, Gender, and Sexuality Studies  
  
Maggie Saponaro, Director of Collection Development Strategies  
  
Daniel Mack, Associate Dean, Collection Strategies & Services

RE: Library Collection Assessment

We are providing this assessment in response to a proposal by The School of Public Policy to create an on-campus/online Post-Baccalaureate Certificate in Science, Technology and Innovation Policy. The School of Public Policy asked that we at the University of Maryland Libraries assess our collection resources to determine how well the Libraries support the curriculum of this proposed program.

### **Serial Publications**

Since this is both an on-campus/online course, it is likely that course assignments will rely heavily upon online journals. The University of Maryland Libraries currently subscribe to many scholarly journals—almost all in online format--that publish articles in the areas of Science, Technology and Innovation.

Because of the many aspects of the proposed program that are listed in the program description, the categories in the Social Sciences Edition of *Journal Citation Reports*\* used to assess our subscriptions are many. The Libraries subscribe to many of the top ranked journals that are listed in the following categories:

Political Science; Multidisciplinary Sciences; Engineering, Environmental, Green and Sustainable Science & Technology; Communication

Those categories are being used for this assessment since they were noted in the program description: (“This program will work in and across a range of science and technology domains such as information & communication technology and energy & environmental technology.”).

Categories:

**Multidisciplinary Sciences – top 5**

Nature  
Science  
Proceedings of the National Academy of Sciences  
Nano Today  
Journal of the Royal Society Interface

**Engineering, Environmental – top 5**

Applied Catalysis B: Environmental  
Chemical Engineering Journal  
Water Research  
Journal of Hazardous Materials  
Resources, Conservation & Recycling

**Green and Sustainable Science & Technology – top 5**

Renewable & Sustainable Energy Reviews  
Green Chemistry  
Journal of Cleaner Production  
ChemSusChem  
Green Energy & Environment

**Communication – top 5**

Communication Monographs  
New Media and Society  
Digital Journalism  
Communication Methods and Measures  
Political Communication

**Additional core journals covering Science, Technology and Innovation**

Annals of the New York Academy of Sciences  
Cybersecurity  
Cybersecurity Policy Report  
Big Data and Society – Open Access  
Economics of Innovation and New Technology  
Environmental Technology & Innovation – Open Access  
IBM Journal of Research and Development  
IEEE Technology and Society Magazine  
Journal of Cybersecurity – Open Access  
Journal of Mixed Methods Research  
Journal of Responsible Innovation  
Public Understanding of Science  
Research Policy  
Science and Public Policy  
Science Communication  
Science, Technology, & Human Values  
Scientific American



Scientometrics  
Sustainability Science  
Technology and Innovation

\*Note: *Journal Citation Reports* is a tool for evaluating scholarly journals. It computes these evaluations from the relative number of citations compiled in the *Science Citation Index* and *Social Sciences Citation Index* database tools.

## Databases

The Libraries' *Database Finder* (<http://www.lib.umd.edu/dbfinder>) resource offers online access to databases that provide indexing and access to scholarly journal articles and other information sources. Many of these databases would be useful for Science, Technology and Innovation.

ACM Digital Library  
ASCE Library  
BioOne  
Building Green  
Communication and Mass Media Complete  
Congressional Publications  
EconLit  
Energywire  
Environment & Energy Daily  
Greenwire  
IEEE Xplore  
IEEE Wiley eBooks  
Materials Science & Engineering Database  
Military and Government Collection  
NTIS Database (National Technical Information Service)  
PAIS  
ScienceDirect  
SocINDEX  
Springer eBooks (2005-2011)  
Web of Science Core Collection  
ICPSR

The following general/multidisciplinary databases are also good sources of articles relevant to this topic: *Academic Search Ultimate*, *MasterFILE Premier*, *JSTOR*, and *ProjectMUSE*.

In many-and likely in most--cases, these databases offer full text copies of the relevant journal articles. In those instances, in which the journal articles are not available or available only in print format, the Libraries can make copies available through the Libraries' Interlibrary Loan service (<https://www.lib.umd.edu/access/ill-article-request>). (Note: see below.)

## Monographs

The Libraries regularly acquire scholarly monographs in Science, Technology and Innovation and allied subject disciplines. Monographs not already part of the collection can usually be added upon request.

Fortunately, more and more monographs are available as e-books. Even in instances when the books are only available in print, students will be able to request specific chapters for online delivery through the Interlibrary Loan program (<https://www.lib.umd.edu/access/ill-article-request>). (Note: see below).

A search of the University of Maryland Libraries' WorldCat UMD catalog was conducted, using a variety of relevant subject terms. This investigation yielded sizable lists of citations of books that we own in print and ebook and published in the last 10 years:

Innovation = 4684

Technological Innovations = 4183 (can add many key words such as: engineering, management, economic aspects, environmental, communication...)

Technology Social Aspects = 2302

Technology and Civilization = 105

Technology and Engineering = 4107

Computer Networks Security Measures = 837

Cybersecurity = 710

Computer and Technology = 127

Environmental Policy = 1102

Keywords to use as opposed to subject headings:

“science and technology”

“science policy”

“science innovation”

A further search revealed that the Libraries' membership in the Big Ten Academic Alliance (BTAA) dramatically increases these holdings and citations.

As with our own materials, students can request that chapters be copied from these BTAA books if the books are not available electronically.

Please note that one limitation of these services that might create some challenges for the online student is that the Libraries are not allowed to make online copies of entire books. The only way that a student can get access to a print copy of an entire book is to physically come to the Libraries and check out that book.

### **Interlibrary Loan Services**

Interlibrary Loan services (<https://www.lib.umd.edu/access/ill>) provide online delivery of bibliographic materials that otherwise would not be available online. As a result, remote users who take online courses may find these services to be helpful. Interlibrary Loan services are available free of charge.

The article/chapter request service scans and delivers journal articles and book chapters within three business days of the request--provided that the items are available in print on the UM Libraries' shelves

or in microform. In the event that the requested article or chapter is not available on campus, the request will be automatically forwarded to the Interlibrary Loan service (ILL). Interlibrary Loan is a service that enables borrowers to obtain online articles and book chapters from materials not held in the University System of Maryland.

### **Additional Materials and Resources**

In addition to journals, monographs and databases available through the University Libraries, students in the proposed program will have access to media, datasets, software, and technology.

Media in a variety of formats that can be utilized both on-site and via ELMS course media is available at McKeldin Library.

GIS Datasets are available through the GIS Data Repository (<http://www.lib.umd.edu/gis/dataset>).

Statistical consulting, workshops and additional research support is available through the Research Commons (<http://www.lib.umd.edu/rc>).

Technology support and services are available through the Terrapin Learning Commons (<http://www.lib.umd.edu/tlc>).

Research Data Services (Data Archiving, Data Management Plans, Managing Data, Open Data) [lib-research-data@umd.edu](mailto:lib-research-data@umd.edu)

The subject specialist librarian for Public Policy, Judy Markowitz, [judym@umd.edu](mailto:judym@umd.edu) also serves as an important resource to programs such as the one proposed. Subject librarians for STEM, Communication, Economics, Environmental Sciences, and Sociology can be called upon to help as needed. Through departmental partnerships, subject specialists actively develop innovative services and materials that support the University's evolving academic programs and changing research interests. Subject specialists provide one-on-one research assistance online, in-person, or via the phone. They also provide information literacy instruction and can provide answers to questions regarding publishing, copyright and preserving digital works.

### **Other Research Collections**

Because of the University's unique physical location near Washington D.C., Baltimore and Annapolis, University of Maryland students and faculty have access to some of the finest libraries, archives and research centers in the country vitally important for researchers in Science, Technology and Innovation Policy. These include the Library of Congress and the National Archives.

### **Conclusion**

With our journals holdings, monographs and databases, as well as additional support services and resources, at this point in time, our assessment is that the University of Maryland Libraries are able to meet the curricular and research needs of the proposed Post-Baccalaureate Certificate in Science, Technology and Innovation Policy.

Every year we are faced with resource inflation costs and a finite budget allocation. The Libraries cannot

guarantee that we will continue to have access to these resources in the near future.

Although journal articles, books and book chapters can be requested and received via Interlibrary Loan (ILL), access to databases cannot be fulfilled this way.

## **Appendix A**

### **Course Catalog Information**

These two courses in the certificate program would be required:

#### **PLCY 688J: Concepts of Technology Change and Innovation**

The course provides a thorough understanding of technology and innovation and the characteristics, determinants and drivers of technological change. The course introduces key analytical constructs such as technology and product life cycles and learning curves, and the range of institutional, market and social factors that affect the diffusion and adoption of technologies, including the concepts of national innovation systems, and innovation support mechanisms.

#### **PLCY 689L: Influence of Science on Policy and Policy on Science**

This course explores how scientific and technical information gets used (or not used) in the formation of public policy, and how public policy influences science and technology development. Students will come away from this course with a fundamental understanding of the institutional landscape of S&T policy, the instruments of S&T policy implementation, and the processes of S&T policy decision-making. This institutional landscape encompasses government, business, academic institutions, and NGOs.

The third required course would be chosen from the following two courses:

#### **PLCY 699B: Modernizing the Energy System**

This course will explore science, technology and innovation policy issues in the context of clean energy technologies and a decarbonized energy system. Key technologies such as renewable energy technologies, intelligent end-use systems and smart grids will be assessed and the course will build an understanding of the dynamics of their development and deployment. Aspects such as innovation support mechanisms, technology cooperation and collaboration and early stage technology finance will be explored.

#### **PLCY 688C: Cyberspace: Legal and Policy Implications**

This course explores the key issues facing policy makers attempting to manage the problem of cybersecurity from its technical foundations to the domestic and international policy considerations surrounding governance, response, and critical infrastructure risk management. Students will be exposed to the integrated technical structures that support modern society and the persistent governance challenges tied to securing critical data and core infrastructures.

The fourth elective course would be chosen from among the courses indicated below (or other new courses that may be approved):

#### **PLCY 780C: Science, Technology, and International Security**

Examines the roles of science and technology (S&T) in the development of conventional (e.g., missiles, bombs) and unconventional (e.g., nuclear, chemical, and biological) weapons and their associated threats to U.S. and international security. Will introduce new ways of thinking about security-technology policy interaction, drawing on political science, security studies, and S&T studies.

#### PLCY 798K: Integrated Modeling for Policy

Focuses on exploring options for adaptation and building resilience to the possible impacts of climate change through an interwoven understanding of the physical, biological, social, cultural, economic and institutional constraints of water resources issues and consideration of climate-related risks in the management and decision-making process

#### PLCY ZZZ: Modeling Strategic Cybersecurity Risk in Critical Infrastructure

Governance of technology is often difficult for policy makers to holistically address due in part to the inability to assess the consequences of cascading failure in complex and interdependent systems. This course explores methods for modelling interconnected infrastructure and processes to quantify strategic risk and exposes students to advanced methods including graph theory, Markov Chains, agent modelling and monte carlo simulation as tools to assess static and dynamic risk.

#### PLCY689K: Decision Analysis

The purpose of this course is to expose students to concepts of risk and uncertainty, and the way in which they are addressed and used in public policy. Within the overall context of regulatory decision-making, quantitative methods to assess risk will be introduced and the process of risk-based decision-making will be elaborated. By the end of the course, students will understand the concepts of risk and risk-informed regulation, and the strengths and limitations of quantitative methods.

#### BISI 708X: Advanced Topics in Biological Sciences – Scholarly Communication and Public Engagement

This course is designed to provide practical knowledge on understanding fundamental aspects of science communication, science policy, and public engagement with science. This course will also provide insights on skill and techniques for engaging in these areas, and networking opportunities for students planning a career in science. The course will build the capacity of students to more effectively interact with the public, the media, and policymakers through a range of mechanisms.

#### ENES 663: Strategies for Managing Innovation

This course emphasizes how innovative leaders can use strategic management of innovation and technology to enhance firm performance. It helps students to understand the process of technological change; the ways that firms come up with innovations; the strategies that firms use to benefit from innovation; and the process of formulating technology strategy. It provides frameworks for analyzing key aspects of these industries and teaches students how to apply these frameworks.

#### ENCE 673: Urban Transportation

The contemporary methodology of urban transportation planning. The urban transportation planning process, interdependence between the urban transportation system and the activity system, urban travel demand models, evaluation of urban transportation alternatives and their implementation.

## **Appendix B**

### **Learning Assessment Plan**

The learning outcomes of the program include:

Learning Outcome 1: Students will understand the principles and practices of science, technology and innovation policy.

Learning Outcome 2: Students will be able to understand the design and implementation of policies targeting science, technology and innovation outcomes in specific science & technology domains – and how these outcomes can advance broader policy goals.

Learning Outcome 3: Students will gain practical skills related to analysis, effective communication and transdisciplinary and interdisciplinary approaches towards complex problems.

Assessment: Formal program review will be carried out according to the University of Maryland's policies including conduct of course evaluations relative to the learning objectives of the program. The evaluations will indicate students' satisfaction with instructor effectiveness and the value of the course. Graduates will be asked to participate in an exit interview to assess the program for its value and relevance and for the effectiveness of its instructors. A follow-up survey will be conducted one year after graduation in light of graduates' current professional activities. Also, the School will seek to measure learning outcomes "directly", that is directly testing how well, not just whether the students have actually learned each of the planned learning outcomes. We will do this by pulling course assignments that directly relate to each outcome and having them scored separately from the course relative to the learning outcomes.



## Appendix C

### Faculty and Courses

The program will utilize SPP's nationally renowned, resident practitioner scholars as well as adjunct practitioners who are preeminent in the field. Permanent faculty member may teach these courses either as part of their regular teaching load or on an overload basis, depending on whether the students are in traditional classes or part of an entrepreneurial cohort. Given the broad scope of STI policy, some of the elective course options are drawn from non-SPP departments and colleges in UMD. All faculty will be members of the Graduate Faculty and approved by the Dean of the Graduate School to teach.

SPP faculty who will likely teach courses in the certificate program include:

- Anand Patwardhan, Professor, School of Public Policy
- Charles Harry, Assoc Research Professor; Director, GoTech; Senior Research Associate, CISSM
- Rosina Bierbaum, Research Professor; Roy F. Westin Chair in Natural Economics
- Jim Gates, Physics
- Kavita Surana, Assistant Research Professor, School of Public Policy
- Leon Clarke, Research Professor, School of Public Policy
- Ryna Cui, Assistant Research Professor, School of Public Policy
- Ellen Williams, Physics
- John Costello, School of Public Policy
- Karen Lips, Biological Sciences
- Thomas Mierzwa, Engineering Science

Course	Faculty
PLCY 688J: Concepts of Technology Change and Innovation	Anand Patwardhan
PLCY 689L: Influence of Science on Policy and Policy on Science	Rosina Bierbaum Jim Gates
PLCY 699B: Modernizing the Energy System	Kavita Surana Ellen Williams
PLCY 688C: Cyberspace: Legal and Policy Implications	Charles Harry John Costello
PLCY 798K: Integrated Modeling for Policy	Ryna Cui Leon Clarke
PLCY ZZZ: Modeling Strategic Cybersecurity Risk in Critical Infrastructure	Charles Harry
PLCY689K: Decision Analysis	Anand Patwardhan
ENCE 673 Urban Transportation	Kaveh Sadabadi
BISI 708X Scholarly Communication and Public Engagement	Karen Lips
ENES 663 Strategies for Managing Innovation	Thomas Mierzwa

## Appendix D

### Actions and Strategies to Recruit and Retain a Diverse Student Body

The Certificate in Science, Technology and Innovation Policy is proposed to be offered on-campus and online. Both versions of the proposed Certificate will seek to recruit and retain a diverse student body in largely the same manner that the School of Public Policy (SPP) currently utilizes for its existing graduate degree and certificate programs. Below is an overview of the School diversity recruiting plan and specific actions to be taken.

#### Overview

1. SPP will show a commitment to diversity and inclusion in curriculum, faculty, and programming and use these activities in promotional materials.
2. SPP will recruit from diverse groups and networks.
3. SPP will encourage diverse current students and alumni to refer friends and colleagues.

#### Recruitment Actions

1. Utilize UMD and SPP organizational relationships for program and application invitations. These include the McNair Post-Baccalaureate Achievement program; network and recruitment events of The Public Policy and International Affairs Program (PPIA), a not-for-profit that has been supporting efforts to increase diversity in public service for 39 years; the Association of Professional Schools of International Affairs (APSIA) Diversity Initiatives, and The Network of Schools of Public Policy, Affairs, and Administration (NASPAA) Diversity Initiatives.
2. Dedicated Historically Black Colleges and Universities (HBCU) informational events that include application fee waivers for attendees and outreach to faculty at minority serving institutions.
3. Leverage diverse current students, alumni, faculty and staff by keeping them apprised of student recruiting events and asking that they share announcements with their networks. These include general events as well as events targeting specific underrepresented populations.

#### Retention

Both the online and on-campus versions of the proposed Certificate in Science, Technology and Innovation Policy will be managed in the same manner as the School's entrepreneurial degree programs – the Master of Professional Studies in Public Administration and the Executive Master of Public Management – that draw domestic and international students. These programs are 'high touch' programs, with customer service provision that allows staff to individually interact with students to forestall any problems that may hinder completion. In this way, retention is thus high for the professional programs overall (over 90%) and equally high for traditionally under represented student populations.

individually interact with students to forestall any problems that may hinder completion. In this way, retention is thus high for the professional programs overall (over 90%) and equally high for traditionally under represented student populations.