Program: Graduate Certificate of Professional Studies in Technology Entrepreneurship

Department / Unit: Maryland Technology Enterprise Institute (Mtech)

College/School: Graduate School

Proposal Contact Person (with e-mail): Dr. James V. Green (jvgreen@umd.edu)

TYPE OF ACTION: Italics indicate that the proposal must be presented to the full University Senate for consideration.

☐ Curriculum change (including modifying minors, concentrations/specializations, and creating informal specializations)
☐ Curriculum Change is for an LEP Program
☐ Renaming of program or formal Area of Concentration
☐ Establish/Discontinue a formal Area of Concentration
☐ Establish a new academic degree/certificate program
☐ Create an online version of an existing program
☐ Establish a new minor
☐ Suspend/Discontinue a degree/certificate program
☐ Establish a new Master or Certificate of Professional Studies program
☐ New Professional Studies program will be administered by Office of Extended Studies
☐ Other:

Summary of Proposed Action (use additional sheet if necessary):
The 12-credit Online Graduate Certificate of Professional Studies in Technology Entrepreneurship (GCTE) unites academic insights with startup incubator skills and resources to empower students to launch and grow technology ventures. The GCTE is an enhancement to the current Master of Professional Studies in Technology Entrepreneurship (MPTE). Students that successfully complete the GCTE will have the opportunity to apply to the MPTE and complete the additional 18-credits to receive the MPS. MPTE was approved on March 5, 2014, PCC log no. 13038.

APPROVAL SIGNATURES: Please print name, sign, and date. Include additional lines for multi-unit programs.

Instructions: When approved by the dean of the college or school, send the proposal and signed form to the Office of the Associate Provost for Academic Planning and Programs, 1119 Main Administration Building, Campus-5031, and e-mail the proposal document as an MSWord attachment to pcc-submissions@umd.edu.

1. Department Committee Chair: Peter Sandborn 12/14/15
2. Department Chair: Peter Sandborn 12/14/15
3. College/School PCC Chair: Somma E. Bucci 12/18/15
4. Dean: Peter Kefives 12/16/2015
5. Dean of the Graduate School (if required): ________________________________
6. Chair, Senate PCC: ________________________________
7. Chair of University Senate (if required): ________________________________
8. Vice President of Academic Affairs & Provost: ________________________________

Unit Code(s) (to be entered by the Office of Academic Planning and Programs):

PCC, Online, Grad Certificate, OES-Administered, p. 1
I. OVERVIEW

The Graduate Certificate of Professional Studies in Technology Entrepreneurship (GCTE) unites academic insights with startup incubator skills and resources to empower students to launch and grow technology ventures. Developed by the A. James Clark School of Engineering’s Maryland Technology Enterprise Institute (Mtech), University of Maryland, GCTE is a fully online program designed to equip students with a conceptual understanding of the principles and action steps of effective new venture creation and launch. As an enhancement to the current Master of Professional Studies in Technology Entrepreneurship (MPTE), students that successfully complete the GCTE will have the opportunity to apply to the MPTE program and to complete the additional 18-credits to receive the Master degree. MPTE was approved on March 5, 2014, PCC log no. 13038.

GCTE is committed to teaching the disciplines of entrepreneurial thinking that produce not just entrepreneurial inspirations but an entrepreneurial frame of mind. The 12-credit, 4-course graduate program may be completed in as little as 6 months. Offered through the convenience and flexibility of the online learning environment, students enroll in two 3-credit courses per 12-week term.

GCTE will prepare students to apply newly gained insights and acquired competencies to real-world innovation management challenges across the initial stages of the innovation value chain from idea generation and strategy to business modeling and market validation.

II. MISSION AND PURPOSE

A. How does the proposed program support the Mission and Strategic Goals of the University? Why is it necessary?

The current mission statement (Mission and Goals Statement, University of Maryland, College Park, April 29, 2014) emphasizes the University’s commitment to “Continue to extend our learning community beyond the campus boundaries through the development of programs that fill demonstrated needs for the State and are consistent with the objectives of our academic programs.” (V.1 p.7).

The University of Maryland is the #1 public university in technology entrepreneurship in the U.S. Its comprehensive entrepreneurship and innovation ecosystem on and beyond campus is uniquely positioned for students to acquire the knowledge, competencies, and relationships to solve today’s and tomorrow’s innovation challenges.

Higher education’s attention to entrepreneurship and innovation is at an all-time high as universities race to enter or expand in these areas. The traditional emphasis of this type of training on MBA students is beginning to expand to undergraduates as well as non-MBA graduate students. Based on Entrepreneur Magazine’s ranking of the top 25 undergraduate colleges for entrepreneurship, over 20,000 undergraduate students are enrolling each year in entrepreneurship courses from the top 25 colleges.

In parallel the undergraduate’s engagement with entrepreneurship, non-credit training in entrepreneurship is rapidly expanding with dramatic growth in MOOCs. The University of Maryland’s Coursera courses in entrepreneurship and innovation have enrolled nearly one million students since 2013.

The intersection of (1) 20,000+ top undergraduates being exposed to entrepreneurship in higher education at a significantly greater rate with (2) nearly one million aspiring and active novice entrepreneurs enrolling in entrepreneurship MOOCs presents a compelling opportunity to provide a practical, accessible, affordable, and robust graduate certificate in entrepreneurship.
The GCTE brings a startup incubator approach to high education in an online format at an affordable cost with the brand and the track record of the University of Maryland and Mtech to serve a global audience.

This University of Maryland degree also benefits from an internal audience generated by the 2,500 undergraduate each year that enroll in entrepreneurship courses throughout campus. Over 300 enroll in Mtech's Minor in Technology Entrepreneurship, and may be interested in furthering their skills and venture activities with the graduate certificate.

With rich market opportunities (1) among graduating seniors from UMD with entrepreneurial interests, (2) throughout U.S. campuses teaching entrepreneurship, and (3) via MOOC entrepreneurship audiences interested in a robust, degree-based experience, the Graduate Certificate of Professional Studies in Technology Entrepreneurship is positioned to launch the next generation of technology entrepreneurs.

B. Identify all related programs currently offered in the State of Maryland and explain how the proposed program differs in curriculum or otherwise addresses constituencies not currently served.

There are currently no Graduate Certificates in this field that lead to a Master of Professional Studies in the State of Maryland.

C. Student Audience and Enrollment Estimates (based on market research analysis).

Target audiences for the Certificate are:

- Graduating seniors of UMD interesting in developing or expanding their technology ventures
- Graduating seniors of USM schools interested in starting companies in or beyond the State of Maryland
- Graduating seniors of the Top 100 entrepreneurial colleges in the U.S.
- Graduating seniors of international universities with relationships with Mtech
- Alumni of Mtech's MOOC on entrepreneurship and innovation
- Alumni of the University of Maryland

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimated Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>15</td>
</tr>
<tr>
<td>Year 2</td>
<td>17</td>
</tr>
<tr>
<td>Year 3</td>
<td>19</td>
</tr>
</tbody>
</table>

III. CHARACTERISTICS OF THE PROPOSED PROGRAM

A. Educational Objectives

The program will prepare graduates so that they can apply newly gained insights and acquired competencies to real-world innovation management challenges across five major stages of the innovation value chain from strategy development and idea generation to commercial concept and product development and successful market establishment, as well as sustainable growth in various contexts.

B. Catalog Description

The Graduate Certificate of Professional Studies in Technology Entrepreneurship unites academic insights with startup incubator skills and resources to empower students to launch and grow technology ventures. This fully online
program is designed to equip students with a conceptual understanding of the principles and action steps of effective new venture creation and launch.

C. Program Requirements that include term/semester format with outline of course offerings, a full listing of courses (number, title, semester credit hours), and other components. Provide a catalog description for any courses that will be newly developed or substantially modified for the program.

The courses in the program are as follows and are each 3 credits. All courses are VPAC approved.

1. ENES662
2. ENES663
3. ENES664
4. ENES665

The program/course outline is as follows:

<table>
<thead>
<tr>
<th>Quarter/Term</th>
<th>Courses</th>
<th>Credits</th>
<th>Delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Term I</td>
<td>ENES662 Innovative Ideas and Concept Development</td>
<td>3</td>
<td>Online</td>
</tr>
<tr>
<td>Term I</td>
<td>ENES663 Strategies for Managing Innovation</td>
<td>3</td>
<td>Online</td>
</tr>
<tr>
<td>Term II</td>
<td>ENES664 Business Modeling and Customer Validation</td>
<td>3</td>
<td>Online</td>
</tr>
<tr>
<td>Term II</td>
<td>ENES665 Innovative Thinking</td>
<td>3</td>
<td>Online</td>
</tr>
</tbody>
</table>

See section X. Other Issues, part C. for continuous registration plan.

D. Will the curriculum of this program rely upon courses provided through other academic units? If so, list both required courses and/or pre-requisites from other units, and include letters from the chairs and/or deans of the appropriate units committing the necessary seats in support of the program.

NOT APPLICABLE.

E. Describe admission policy, including any special criteria for students selecting this program.

Applicants must meet the following minimum admission criteria as established by the Graduate School:

- Applicants must have earned a four-year baccalaureate degree from a regionally accredited U.S. institution, or an equivalent degree from a non-U.S. institution.
- Applicants must have earned a 3.0 GPA (on a 4.0 scale) in all prior undergraduate and graduate coursework.
- Applicants must provide an official copy of a transcript for all of their post-secondary work.

International students must fulfill all requirements relating to international academic credentials, evidence of English proficiency, financial certification, and visa documentation. These requirements are found at the Graduate School's Web site: http://www.gradschool.umd.edu/prospective_students/international_admissions.html. Because this is a fully online program, UMD does not issue immigration documents for students.

IV. STUDENT LEARNING OUTCOMES AND ASSESSMENT

The purpose of this assessment plan is to set clear guidelines, identify articulated outcomes including educational objectives and any areas of concentration.
A. Students will demonstrate the following learning outcomes:

The program will enable graduates to generate and launch technology-based ventures through a two-step process:

- Think beyond current paradigms in order to discover innovation needs and to envision impact through strategic ideation and concept development.
- Leverage ideas to create sustainable business models aligned with customer needs and wants in competitive marketplaces.

B. Provide a description of assessment methods.

- Mastery of content: Classroom performance, course exams and papers, and capstone writing project.
- Professional communication (written and oral): Classroom performance, course exams and papers, and capstone writing project.
- Development of values and ethics: Classroom performance, course exams and papers, and satisfactory completion of assignments.
- Critical and creative thinking: Classroom performance, course exams and papers, and capstone writing project.

V. ORGANIZATION AND OVERSIGHT

A. Who will provide academic direction and oversight for the program?

Graduate School Representative
Charles Caramello, Dean of the Graduate School

Graduate Director
Dr. James V. Green, Director of Entrepreneurship Education, Mtech

Office of Extended Studies Administrative Support and Oversight
Terrie Hruzd, Director of Programs

B. If the program is not to be housed and administered within a single academic unit, provide details of its administrative structure.

The Graduate Certificate in Professional Studies in Technology Entrepreneurship will be housed in the Graduate School, which will be responsible for its oversight. The Program Oversight Committee, or designates, will administer the program. A faculty member from the college will serve as the Graduate Director and will provide academic leadership. The Office of Extended Studies will provide coordination.

Academic Coordination

Faculty selection and appointments are made by the academic unit. The academic unit provides academic and advising oversight to both incoming and admitted students. The academic unit will oversee see program marketing.

Administrative Coordination

The Office of Extended Studies will provide program development support (including budget development and projections), program management that includes scheduling, marketing research, planning and management,
financial management (including faculty contracting and faculty pay processing), and student services management (including support for admissions, registration, payment, financial aid, and other campus services).

VI. FACULTY, NEEDS, AND RESOURCES

Faculty selection and appointments are made by the academic unit. The faculty may include Professional Track faculty, retired faculty, and professionals in the field. All faculty must be approved by the Dean of the Graduate School to teach. UMD faculty who in teach in the program will be compensated using overloads. A faculty member can only be paid for teaching courses above their regular appointment if s/he has met the requirements of the position and the supervisor has approved the overload. The overload is submitted via PHR. Teaching on an overload basis requires approval each year. Faculty members who buy out of an overload course (e.g. with research grant funds) would have to consult with a college and agency official to determine if they can be paid for teaching an overload course. For complete information regarding the UMD overload policy, visit: http://www.provost.umd.edu/pers-bud/Forms/oloadguide2.html. Additionally, programs must follow Maryland Higher Education Commission Code of Maryland (COMAR) regulations. In particular, COMAR 13B.03.03.11 requires that at least 50% of the total semester credit hours within the proposed program be taught by full-time faculty. For off-campus programs, COMAR 13B.02.03.20 states that at least 1/3 of the classes offered in an off-campus program shall be taught by full-time faculty of the parent institution.

A. List Program Faculty and their Credentials (professional rank/title).

Dr. James V. Green

Dr. Green leads the education activities of the Maryland Technology Enterprise Institute (Mtech) at the University of Maryland. As Director of Entrepreneurship Education, he leads the Master of Technology Entrepreneurship and Minor in Technology Entrepreneurship, designs and teaches undergraduate and graduate courses in entrepreneurship and technology commercialization, leads seed funding programs, and manages residential entrepreneurship programs for students. In 2011, he earned first prize in the 3E Learning Innovative Entrepreneurship Education Competition presented at the United States Association for Small Business and Entrepreneurship (USASBE) annual conference to recognize college educators who have created new and challenging learning activities that actively involve students in the entrepreneurial experience. Prior to the University of Maryland, Dr. Green held founder, executive, and operational roles with multiple startups to include WaveCrest Laboratories (an innovator in next-generation electric and hybrid-electric propulsion and drive systems), Cyveillance (a software startup and world leader in cyber intelligence and intelligence-led security), and NetMentors (the first national career development eMentoring community). Dr. Green earned a Doctor of Management and an MS in Technology Management from the University of Maryland University College, an MBA from the University of Michigan, and a BS in Industrial Engineering from Georgia Tech.

Dr. Thomas J. Mierzwa

Dr. Mierzwa has more than 20 years of teaching experience at University of Maryland and other universities, with courses in strategy, innovation, and entrepreneurship. His teaching philosophy centers on building student competency through course design and teaching exercises, and his research interests include innovation processes, opportunity recognition, design thinking and conceptual tools for learning objects. Dr. Mierzwa founded The Fountainhead Group, a team of specialists who conduct innovation audits, and is the founder of Creative Agreements, a professional services firm that uses a mediation approach to form working agreements among
business owners during venture start-ups. He serves on advisory boards of several Maryland businesses. At the Academy of Management, he chairs a committee on non-traditional academics and is active on the Teaching Theme Committee. He is also a board member of the Executive DBA Council, an institution of member schools fostering development of practitioner-scholar doctoral programs worldwide. Dr. Mierzwa earned a Doctor of Public Administration in strategic management from the University of Southern California and a master's in urban design from Harvard University.

Frankie Abralind

Frankie Abralind is the founder of HTA Design Thinking, a business strategy consulting firm that uses the human-centered process to help companies grow. His expertise is in design thinking, service design, and user experience. Frankie is the director of Design Thinking DC, a 2,200 member community of design thinkers in Washington, DC. He brings together people from business, design, technology and beyond to learn and share best practices and creative solutions. Frankie is a champion of radical collaboration on methodologies, practices, and experiences to facilitate and deliver innovation in the world. Previously, Frankie served as creative director for Branson & Byrne, a creative marketing agency, and in executive operational and marketing roles with manufacturing firms. After studying design at Cornell University, Frankie earned his MBA at the University of Maryland's Smith School of Business.

Daniel Gordon

Dan Gordon has over 30 years of experience working with technology, as a computer scientist, software developer, manager, analyst, and entrepreneur. As a technology partner with Valhalla Partners, Dan brings together the most respected and successful venture investors in the region. Valhalla Partners' present and past investments have resulted in 27 M&As, 22 IPOs, and over $1 billion in investment proceeds. Prior to joining Valhalla Partners, Dan was a director and senior staff member at the PricewaterhouseCoopers Global Technology Centre, analyzing technology trends and consulting on technology-oriented strategies in the software, e-business, wireless, optical, networking, semiconductor, and life sciences arenas. He worked with clients from North America, Europe, the Middle East, and Australia. Dan was a Contributing Writer and Contributing Editor to the Technology Centre's annual Technology Forecast, and a frequent speaker at industry and general business meetings. Prior to joining PwC, Dan spent 20 years in Silicon Valley as a software technologist, manager, director, and entrepreneur, including senior technical roles at well-known Silicon Valley firms like Symantec, Intuit, and Oracle. Dan has also been involved in startup companies in the applied artificial intelligence and web applications fields. Dan has a BA from Harvard University and an MS from New York University in Computer Science.

B. Some of these teaching, advising, and administrative duties may be covered by existing faculty and staff. Describe your expectations for this, and indicate how the current duties of these individuals will be covered, and the source of any needed resources.

Approval of all faculty overloads for teaching and advising will be in accordance with University of Maryland policy and procedures. The Oversight Committee is responsible for the overall administrative management of the program.

C. List new faculty needed and indicate the source of the resources for hiring them.

Tuition revenue will be used to support all salaries and benefits.

D. Describe the anticipated advising and administrative loads. Indicate the personnel resources (administrative staff and teaching assistants) that will be needed to cover all these responsibilities.
The current staff for the MPTE will take on the additional responsibilities of the GCTE. Due to the overlap in administrative, application, and advising with the Professional Master and Certificate, these resources will not be taxed due to the additional student population. Tuition revenue will be used to support all salaries and benefits.

VII. LIBRARY AND PHYSICAL RESOURCES

A. Required Library Resources. (To be determined in cooperation with the Libraries. A member of the Libraries' staff will conduct an assessment and prepare a letter describing the collection needs).

See attachment.

B. Required additional facilities, facility modifications, and equipment. Include faculty and staff office space, laboratories, special classrooms, computers, etc.

None.

C. Impact, if any, on the use of existing facilities and equipment. Examples are laboratories, computer labs, specially equipped classrooms, and access to computer servers.

This program does not require additional resources.

VIII. PROGRAM RESOURCES

A. Identify the source to pay for the required faculty, administrative, advising, and physical resources identified in Sections V. and VI. above.

Tuition revenue will be used to cover all program expenses (salaries, benefits, program materials, and physical resources). All students will pay all associated mandatory fees and the graduate application fee. This self-support program will have no impact on the unit's traditional programs.

B. Complete the financial tables as required by MHEC.

See attached pdf.

IX. PROPOSED MEANS OF OFFERING PROGRAM

A. Will any or all components of this program be offered off-campus or at another instructional site? If so, provide detailed information. Location must be an approved institutional site. Indicate how students will access student services.

Not applicable.

B. If on-line or thru distance learning —describe the concerns in “Principles and Guidelines for Online Programs” are to be addressed.

1. Program Initiation and Choice: The proposal should initiate with an academic unit, and must have the approval of the appropriate Dean (or Deans). It must develop naturally from the institution's strengths and be consistent with its strategic goals. The proposal should have a clear and well-thought-out financial plan, providing net revenue to the institution over time, and should include a thorough analysis of the potential market.
The program was developed by the Maryland Technology Enterprise Institute (Mtech), a unit of the A. James Clark School of Engineering, whose mission is to educate the next generation of technology entrepreneurs, help them create successful technology ventures, and connect companies with University of Maryland resources to help them succeed. Building on the success of the Master of Professional Studies in Technology Entrepreneurship, the Office of Extended Studies and Mtech agree that offering a Graduate Certificate of Professional Studies in the same area will capture the unmet needs of their target audiences.

2. **Program Development, Control, and Implementation by Faculty**: Although professional help may be used in adapting it to the online medium, the academic content of the curriculum must be developed by institutional faculty. The instructional strategy proposed must be appropriate for this content. UMCP faculty must have overall control of the program, and should provide the bulk of the instruction. Appropriate resources, including technical support personnel, must be made available for course development and also for faculty support during the offering of these courses. The business plan for the proposal must spell out the arrangements whereby this will be accomplished.

The University of Maryland's Division of Information Technology has identified vendors who provide instructional design and technical support for faculty and staff in self-support programs. The Office of Extended Studies provides oversight of all administrative services and management of the instructional design and quality assurance for all course development and conversion processes. Program tuition and fees is used to support this resource.

3. **Access to Academic Resources and Student Services**: The proposal must indicate how students will have access to needed resources such as library materials, other information sources, laboratory facilities, and others as appropriate. The arrangements in place for interaction with instructors, for advising, and for help with technical problems must be described. It must be shown how student services such as admissions, enrollment, financial aid, bursar services, career advisement, bookstore, and similar services available to on-campus students will be provided.

As officially admitted students to the University of Maryland, students in this program will have access to all University resources that are accessible in the online environment. Students obtain a UID and may access these services as required. Students are assessed the online student services fee which supports access to online University resources. The academic unit provides academic and advising oversight. Extended Studies provides the management of all student services.

4. **Intellectual Property Rights**: The proposal must clearly delineate ownership and usage rights for materials that may be developed for courses in the program.

Intellectual property rights for both the program and online courses will be addressed in a separate contract executed by the University of Maryland and the developer. Please see Article VIII On-Line Studies and Technology-Mediated (Enhanced) Courses in the UNIVERSITY OF MARYLAND POLICY ON INTELLECTUAL PROPERTY (Policy IV-3.20(A) (Approved by the President on March 13, 2003 and by the Chancellor on July 18, 2005) On-line at http://www.president.umd.edu/policies/iv320a.html.

5. **Full Disclosure, Standards, and Evaluation**: All published materials describing the program must carefully lay out the instructional methods to be used, the skills and background required for success, and the arrangements in place for access to instructors, to technical help, to academic resources, and to student services. There should be a means available whereby potential students can evaluate their readiness for the special demands of the program. Academic admission standards must be clearly described, and must be consistent with those for the on-campus program. Outcome expectations must also be consistent. The proposal must set out a continuing process of evaluation that will determine if these requirements are being met.
The Oversight Committee will ensure that all printed and digital materials provide exhaustive information about the program. The Web site, administered through Extended Studies, will provide complete and transparent policies and procedures regarding admission requirements (in full compliance of the Graduate School), including registration, financials, technical assistance, digital access to university resources, academic and university policies, and all issues relating to the successful completion of the program. Potential students will be given the opportunity to complete a self-assessment ensuring that they possess the skill sets and mental models for online learning as well as the technical resources for program accessibility. The academic unit provides both incoming and admitted students with all advising assistance.

C. If in cooperation with another institution, provide detailed information.

NOT APPLICABLE.

D. If through a non-traditional schedule (weekends, intensive course offerings), provide detailed information.

NOT APPLICABLE.

X. OTHER ISSUES

A. Will the program require or seek accreditation? Is it intended to provide certification or licensure for its graduates? Are there academic or administrative constraints as a consequence?

NOT APPLICABLE.

B. Are students in other programs permitted to enroll in courses in this program? Can students substitute courses from other institutions?

Courses offered in the proposed program are limited solely to students who have been admitted to this program. Other UMD graduate students are not permitted to register for courses in this program. Students are not allowed to substitute courses from another institution to satisfy the program requirements.

C. What are the protocols for students unwilling or unable to follow courses in sequence, e.g. would they have to wait for the next cycle or next cohort?

For a student who does not complete the courses in the proposed sequence, the student may enroll in any courses offered in a particular term if the prerequisites are met. The student may continue in the program by taking the necessary courses when offered. If the department recognizes a significant need to offer a particular course in a specific term, the department may opt to offer the course to meet students’ needs.

D. What is the exit strategy if the program proves not to be viable? How are canceled courses handled?

The Department fully expects to offer courses each semester as proposed; however, if a course is canceled, it will be either offered in a subsequent semester or students may take one term/semester longer to complete the program. If the program does not prove to be viable, the department will ensure that courses are offered in a manner that permits all existing students to complete the program.
XI. COMMITMENT TO DIVERSITY

The University of Maryland is an equal opportunity institution with respect to both education and employment. The University does not discriminate on the basis of race, color, national origin, sex, age, or handicap in admission or access to, or treatment or employment in, its programs and activities as required by federal (Title VI, Title IX, Section 504) and state laws and regulations. Through its actions and statements of policy the University of Maryland has demonstrated a commitment to diversity by creating programs of study which explore the experiences, perspectives, and contributions of a wide variety of cultures, groups, and individuals; and as sought to create a campus environment which encourages tolerance and respect for individuals regardless of differences in age, race, ethnicity, sex, religion, disability, sexual orientation, class, political affiliation, and national origin.
Dear Ms. Sazama:

The University of Maryland Libraries provide this assessment in response to the proposal to offer a Graduate Certificate of Professional Studies in Technology Entrepreneurship within the A. James Clark School of Engineering's Maryland Technology Enterprise Institute. You asked that we assess our collections to determine how well the Libraries will be able to support the curriculum of this proposed graduate certificate. We offer the following assessment, and conclude that the Libraries are able to support this program.

**Serial Publications and Research Databases**

For this online program, curricular assignments and scholarly library research will rely primarily upon online serial publications. The University of Maryland Libraries currently subscribe to a large number of scholarly journals, almost all in online format, that publish current research in areas relating to technology entrepreneurship. Most articles in journals that we do not own electronically are available through either the Libraries' Article Express Program or via Interlibrary Loan. The Libraries' "Database Finder" offers online access to databases that provide indexing and access to popular and scholarly journal articles, and other information sources. Many of these databases cover subject areas that would be relevant to this proposed graduate certificate. For students in online classes, these databases can be accessed remotely by authenticating using UMD login credentials. Most of the relevant technology-focused research is available through the following databases to which the Libraries subscribe:

- IEEEExplore
- ACM Digital Library
- Web of Science

For industry and business aspect of data science the following databases are of interest:

- Business Source Complete
- Business and Industry
Monographs

The Libraries' current collection of books related to technology entrepreneurship is sufficient to meet the needs of the program. The ongoing acquisition of scholarly books is expected to be adequately covered through existing acquisition practices and budgeting. As the University of Maryland already has a robust tradition of emphasizing entrepreneurship and innovation, current collection development practices in the Libraries already support these topics. Due to the UM Libraries purchasing preference for electronic based materials, the online monograph collection should support the online aspect of the proposed graduate certificate.

Even in instances when the books are only available in print, the students will be able to take some advantage of the book collection by requesting specific chapters be sent to them through the Libraries' Article Express program. Faculty can also request, within fair use copyright guidelines, that sections of print books be made available digitally through course reserves.

Article Express and Interlibrary Loan

These services offer online delivery of bibliographic materials that otherwise would not be available online. As a result, remote users who take online courses will find these services to be quite helpful. Article Express and Interlibrary Loan are available free of charge. As a program developed specifically to support advanced research and teaching for graduate students and faculty, the Article Express service scans and delivers journal articles and book chapters within three business days of the student's request, provided that the items are available in print on the UM Libraries' shelves. In the event that an article or chapter is not available on campus, Article Express will automatically refer the request to Interlibrary Loan (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.

Conclusion

The University of Maryland Libraries' serials holdings and research databases have an established record for providing bibliographic support for researchers and professionals in subject disciplines that are relevant to technology entrepreneurship. These materials are supplemented by relevant monograph collections. In addition, the Libraries' Article Express and Interlibrary Loan services make materials that otherwise would not be available online, accessible to remote users in online courses. The Libraries also offer students a wide range of services to ensure their success. Additionally, the libraries are already supporting the Master of Professional Studies in Technology Entrepreneurship (MPTE), so no additional library resources should be necessary for the proposed graduate certificate, which compliments the Master's program. As a result, our assessment is that the University of Maryland Libraries are able to meet the curricular and research needs of the proposed Graduate Certificate in Professional Studies in Data Science.
In addition, the general, multidisciplinary database *Academic Search Complete* provides information for nearly every area of academic study. Includes an enormous collection of the most valuable peer-reviewed full text journals, as well as additional journals, magazines, newspapers and books.

As noted previously, in those instances in which either the Libraries do not subscribe to the journal or the journal articles are available only in print format, the Libraries can supply copies through the Libraries’ Article Express Program or via Interlibrary Loan.
Sincerely,

Daniel C. Mack
Associate Dean, Collection Strategies and Services
## Budget: Graduate Certificate of Professional Studies Technology Entrepreneurship (online)

[This program is self-support. Instructors may not teach on-load.]

### Estimated Program Revenue & Support

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Total Tuition Revenue</strong></td>
<td>$39,840</td>
<td>$47,410</td>
<td>$55,637</td>
<td>$64,568</td>
<td>$74,253</td>
</tr>
<tr>
<td>A. Total number of students (per year)</td>
<td>15</td>
<td>17</td>
<td>19</td>
<td>21</td>
<td>23</td>
</tr>
<tr>
<td>B. Total Courses: (3 credits each)</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>C. Tuition rate; Assumes 5% increase</td>
<td>$664</td>
<td>$697</td>
<td>$732</td>
<td>$769</td>
<td>$807</td>
</tr>
<tr>
<td><strong>II. Student Fee: Online Mandatory Fee</strong></td>
<td>$2,820</td>
<td>$3,260</td>
<td>$3,716</td>
<td>$4,190</td>
<td>$4,680</td>
</tr>
<tr>
<td>A. Rate per term; assumes 2% increase</td>
<td>94</td>
<td>96</td>
<td>98</td>
<td>100</td>
<td>102</td>
</tr>
<tr>
<td>B. Total number of terms (per year)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>C. Total number of students (per year)</td>
<td>15</td>
<td>17</td>
<td>19</td>
<td>21</td>
<td>23</td>
</tr>
<tr>
<td><strong>III. Student Fee: Graduate School Application Fee</strong></td>
<td>$1,125</td>
<td>$1,275</td>
<td>$1,425</td>
<td>$1,575</td>
<td>$1,725</td>
</tr>
<tr>
<td>A. Fee (one-time)</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td><strong>IV. Development Support</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Extended Studies Support (75% of Total; not to exceed $25,000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Dean Support (25% of Total)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Estimated Program Revenue &amp; Support</strong></td>
<td>$43,785</td>
<td>$51,945</td>
<td>$60,778</td>
<td>$70,332</td>
<td>$80,658</td>
</tr>
</tbody>
</table>

### Estimated Program Expenses

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Instructional Totals</strong></td>
<td>$32,400</td>
<td>$33,372</td>
<td>$34,373</td>
<td>$35,404</td>
<td>$36,466</td>
</tr>
<tr>
<td>1. Instructor Totals (assumes 3% annual increase)</td>
<td>30,000</td>
<td>30,900</td>
<td>31,827</td>
<td>32,782</td>
<td>33,765</td>
</tr>
<tr>
<td>a. Instructor Salary (50% paid by MPS)</td>
<td>7,500</td>
<td>7,725</td>
<td>7,957</td>
<td>8,195</td>
<td>8,441</td>
</tr>
<tr>
<td>b. Total # of Instructors</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2. Benefits: Total FICA (8%)</td>
<td>2,400</td>
<td>2,472</td>
<td>2,546</td>
<td>2,623</td>
<td>2,701</td>
</tr>
<tr>
<td><strong>II. Marketing</strong></td>
<td>$5,000</td>
<td>$5,000</td>
<td>$5,000</td>
<td>$5,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>A. Program Marketing</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
</tr>
<tr>
<td><strong>III. Development - Courses</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1. Development of New Courses: Faculty Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2. Ttl # of new courses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B1. Fee for Online Format (per course)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B2. Ttl # of courses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal: Estimated Program Expenses</strong></td>
<td>$37,400</td>
<td>$38,372</td>
<td>$39,373</td>
<td>$40,404</td>
<td>$41,466</td>
</tr>
<tr>
<td><strong>IV. Student Fees (100% returned to campus)</strong></td>
<td>$3,945</td>
<td>$4,535</td>
<td>$5,141</td>
<td>$5,765</td>
<td>$6,405</td>
</tr>
<tr>
<td>A. Campus Mandatory Fee</td>
<td>2,820</td>
<td>3,260</td>
<td>3,716</td>
<td>4,190</td>
<td>4,680</td>
</tr>
<tr>
<td>B. Graduate School Application Fee</td>
<td>1,125</td>
<td>1,275</td>
<td>1,425</td>
<td>1,575</td>
<td>1,725</td>
</tr>
<tr>
<td><strong>V. Net OES Administrative Fee</strong> (OES absorbs UM Campus Overhead as an expense; reduces OES Administrative Fee)</td>
<td>$2,364</td>
<td>$3,072</td>
<td>$3,845</td>
<td>$4,687</td>
<td>$5,602</td>
</tr>
<tr>
<td>A. OES Administrative Fee = 10% of tuition revenue</td>
<td>3,984</td>
<td>4,741</td>
<td>5,564</td>
<td>6,457</td>
<td>7,425</td>
</tr>
<tr>
<td>B. OES Development Recovery Fee = 10% of tuition revenue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. UM Campus Overhead Rate = 5% of direct expenses paid by OES</td>
<td>1,620</td>
<td>1,669</td>
<td>1,719</td>
<td>1,770</td>
<td>1,823</td>
</tr>
</tbody>
</table>
### Estimated Program Expenses

<table>
<thead>
<tr>
<th></th>
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<th>Year 4</th>
<th>Year 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>VI. Graduate School Administrative Fee</td>
<td>1,800</td>
<td>2,040</td>
<td>2,280</td>
<td>2,520</td>
<td>2,760</td>
</tr>
<tr>
<td>A1. Fee assessed per each academic semester/term</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>A2. Total number of semesters/terms per year</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>A3. Total number of students</td>
<td>15</td>
<td>17</td>
<td>19</td>
<td>21</td>
<td>23</td>
</tr>
<tr>
<td>Total Estimated Program Expenses</td>
<td>$43,709</td>
<td>$45,979</td>
<td>$48,359</td>
<td>$50,856</td>
<td>$53,474</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
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<th>Year 5</th>
</tr>
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<tbody>
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<td>$51,945</td>
<td>$60,778</td>
<td>$70,332</td>
<td>$80,658</td>
</tr>
<tr>
<td>Total Estimated Program Expenses</td>
<td>$43,709</td>
<td>$45,979</td>
<td>$48,359</td>
<td>$50,856</td>
<td>$53,474</td>
</tr>
<tr>
<td>Net Revenue (for Distribution)</td>
<td>$76</td>
<td>$5,965</td>
<td>$12,418</td>
<td>$19,477</td>
<td>$27,184</td>
</tr>
</tbody>
</table>

### Online Certificate Completion Assumptions

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td># of terms per year</td>
<td>2</td>
</tr>
<tr>
<td># of courses per term</td>
<td>2</td>
</tr>
<tr>
<td># of courses per year</td>
<td>4</td>
</tr>
<tr>
<td># of instructors per year</td>
<td>4</td>
</tr>
<tr>
<td>To complete the 12-credit; 4 course program:</td>
<td></td>
</tr>
<tr>
<td>Students take 4 courses (12 credits)</td>
<td>12</td>
</tr>
</tbody>
</table>

### Cumulative 5 Yr

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TTL Revenue/Support</td>
<td>$307,498</td>
</tr>
<tr>
<td>TTL Expenses</td>
<td>$242,377</td>
</tr>
<tr>
<td>TTL Net</td>
<td>$65,121</td>
</tr>
</tbody>
</table>