CAPITOL TECHNOLOGY UNIVERSITY

1927

February 20, 2018

Bradford L. Sims, PhD
President

Dr. James D. Fielder, Jr.
Secretary of Maryland Higher Education
Maryland Higher Education Commission
6 N. Liberty Street
Baltimore, MD 21201

Dear Dr. Fielder,

Capitol Technology University is requesting approval to offer a **Doctor of Philosophy (Ph.D.) in Unmanned Systems Applications**. The degree curriculum will be taught using a significant number of existing faculty at our university and is supplemented by new courses supporting the Ph.D. in Unmanned Systems Applications.

The mission of Capitol Technology University is to provide practical education in engineering, computer science, information technology, and business that prepares individuals for professional careers and affords the opportunity to thrive in a dynamic world. A central focus of the university's mission is to advance practical working knowledge in areas of interest to students and prospective employers within the context of Capitol's degree programs. The university believes that a Ph.D. in Unmanned Systems Applications is consistent with this mission.

A terminal degree in Unmanned Systems Applications is a specific need identified by industry and government communities. According to industry experts, Unmanned and Autonomous Systems Applications is a skill set of increasing value to employers. It is desirable across many fields, across a variety of job categories and levels of employment. A critical gap between the supply and demand of skilled Unmanned and Autonomous Systems Applications professionals is already reaching crisis proportions. Increasing demand, in turn, translates into a growing need for universities and other academic institutions to develop a program that educates Unmanned Systems Application professionals at the highest level and for all industries.

To respond to industry need, we respectfully submit for approval a Doctor of Philosophy (Ph.D.) in Unmanned Systems Applications. The required proposal is attached as is the letter from me as university president confirming the adequacy of the university's library to serve the needs of the students in this degree.

Respectfully,

Bradford L. Sims, PhD

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President

February 20, 2018

Dr. James D. Fielder, Jr.
Secretary of Maryland Higher Education
Maryland Higher Education Commission
6 N. Liberty Street
Baltimore, MD 21201

Dear Dr. Fielder,

This letter is in response to the need for confirmation of the adequacy of the library of Capitol Technology University to support the proposed Doctor of Philosophy (Ph.D.) in Unmanned Systems Applications. As president of the university, I confirm that the library resources, including support staff, are more than adequate to support the Ph.D. in Unmanned Systems Applications. In addition, the university is dedicated to, and has budgeted for, continuous improvement of library resources.

Respectfully,

Bradford L. Sims, PhD

PROPOSAL FOR:

__X__ NEW INSTRUCTIONAL PROGRAM

_____ SUBSTANTIAL EXPANSION/MAJOR MODIFICATION

_____ COOPERATIVE DEGREE PROGRAM

__X__ WITHIN EXISTING RESOURCES or____ REQUIRING NEW RESOURCES

**CAPITOL
TECHNOLOGY
UNIVERSITY**

1927

Institution Submitting Proposal

Fall 2018

Projected Implementation Date

Doctor of Philosophy (Ph.D.) Award to be Offered	**Doctor of Philosophy in Unmanned Systems Applications** Title of Proposed Program
0902.01 Suggested HEGIS Code	**14.4201** Suggested CIP Code
Doctoral Programs Department of Proposed Program	**Dr. Helen Barker** VP Academic Affairs, CAO

Dr. Helen Barker Contact Name	**hgbarker@captechu.edu** Contact E-Mail Address	**240-965-2510** Contact Phone Number

_2-20-18_

Signature and Date

President/Chief Executive Approval

_2-20-2018_

Date

Date Endorsed/Approved by Governing Board

Proposed Doctor of Philosophy in Unmanned Systems Applications
Department of Doctoral Programs
Capitol Technology University
Laurel, Maryland

A. Centrality to institutional mission statement and planning priorities:

1. **Program description and relationship to university mission and how it relates to the institution's approved mission.**

   Doctor of Philosophy in Unmanned Systems Applications Program Description:

   The Doctor of Philosophy in Unmanned Systems Applications provides students with the opportunity to conduct extensive and sustained original research in the fields of Unmanned Systems. Capitol Technology University is in a unique position to provide students with an avenue to pursue a deep proficiency in this area using an interdisciplinary methodology. Graduates will contribute significantly to their chosen field through the creation of new knowledge and ideas. Further, as a doctorate by research, students will quickly be able to engage in research and publishing without the need to navigate the limitations inherent in traditional coursework models.

   The Doctor of Philosophy in Unmanned Systems Applications will prepare the students to take roles as leaders in the Unmanned Systems fields. The student will begin their path to success by working with a research committee from Capitol Technology University to develop a research proposal. The student will then work independently to conduct the study and produce a meaningful body of original research of publishable quality. In addition to the technology, students will be able to defend their knowledge of the legal, political, ethical, and social dimensions of their field of research. The PhD in Unmanned Systems Applications will prepare students to achieve a more profound understanding within the interdisciplinary field of Unmanned Systems.

   The Doctor of Philosophy in Unmanned Systems Applications is designed for students with an appropriate Master's degree. The Doctor of Philosophy in Unmanned Systems Applications degree begins at the doctoral level with students conducting original research in an approved topic of Unmanned Systems. Successful completion of the program culminates in the award of the Doctor of Philosophy in Unmanned Systems Applications degree.

   There are two options for completion of the Doctor of Philosophy in Unmanned Systems Applications program:

   Dissertation Option: the student will produce, present, and defend a doctoral dissertation after receiving the required approvals from the student's Committee and the Ph.D. Review Board.

   Publication Option: the student will produce, present, defend their original doctoral research after receiving the required approvals from the student's Committee and the Ph.D. Review Board. The student must also publish three works of original research in a scholarly peer-reviewed journal(s) of high stature.

Relationship to Institutional Approved Mission:

The Doctor of Philosophy (Ph.D.) in Unmanned Systems Applications is consistent with the University mission to provide educational opportunity to individuals in information science, engineering, computer science, information technology, and business. We provide relevant learning experiences that lead to success in evolving global community. Fundamental to the degree programs in the Department of Doctoral Programs are opportunities to pursue cutting edge knowledge in technological applications. The Ph.D. in Unmanned Systems Applications is consistent with that philosophy. This same philosophy is supported by existing degree programs and learning opportunities. The university has a Doctor of Science (D.Sc.) in Cybersecurity, a Ph.D. in Business Analytics and Decision Science, and a Ph.D. in Technology. The Ph.D. in Unmanned Systems Applications degree is an integral part of the Strategic Plan for FY 2017-2021 and forward. Funding to support the new degree has been included in institutional and departmental budgets for FY 2018-2019 and forecasted budgets going forward.

The Ph.D. in Unmanned Systems Applications degree will be offered in the online format using tools such as Adobe Connect and Canvas. This results in the convenience required by the 21st Century learner, and provides interaction with faculty and fellow students critical to the high-level learning experience. The curriculum provides the doctoral student the necessary learning tools the University believes critical to success in the modern business and government environments. The degree is also consistent with the interdisciplinary nature of the University.

2. **Explain how the proposed program supports the institution's strategic goals and provide evidence that affirms it is an institutional priority.**

   Capitol Technology University operates on five strategic goals:

   1. **Elevate Education and Academic Quality:** *The University is an institution that offers career relevant curriculum with quality learning outcomes.*

   2. **Expand Enrollment and Reputation:** *The University will become more globally renowned and locally active through student, faculty, and staff activities.*

   3. **Diversify and Increase Financial Resources:** *The University will enhance its financial resources by expanding the range and amount of funding available to the institution, aligning costs with strategic initiatives, and expanding corporate relationships.*

   4. **Maintain Institutional Viability:** *The University is committed to providing relevant learning in a quality learning environment.*

   5. **Extend Our Family of Organizational Partners:** *The mission of Capitol Technology University is to provide relevant learning experiences that lead to success in the evolving global community.*

   The new Ph.D. in Unmanned Systems Applications supports all the university's strategic goals. This approach builds upon the already successful graduate areas of study, such as the Doctor of Science in Cybersecurity, Doctor of Philosophy in Business Analytics and Decision Science, Master of Science in Electrical Engineering, Master of Science in Internet Engineering, Master of Science in Cyber and Information Security degrees, Master of Science in Computer Science, and Master of Science in Information Systems Management (which integrates business and technology at the

graduate level). In addition, the University has two new Technical Master of Business Administration degrees and a Master of Science in Cyber Analytics degree that were recently approved by the Maryland Higher Education Commission (MHEC). Capitol Technology University's programs are structured to teach students critical leadership, technical and business skills necessary to meet the needs of a modern technology and information-dependent society. The university's programs have been preparing professionals for rapid advances in information and technology, intense global competition, and increasingly complex technological environments for decades. The Ph.D. in Unmanned Systems Applications will allow students to increase their knowledge to the extreme limits of unmanned and autonomous technology and its impacts across all industry segments.

The new Ph.D. in Unmanned Systems Applications is fully supported by the university's Vision 2025 and Strategic Plan 2017-2021. Funding to support the degree has been included in forecasted budgets going forward.

The university has active partnerships (e.g., Textron, Leidos, Patton Electronics, Lockheed Martin, Northrup Grumman, and Cyber Security Forum Initiative, IRS, and SAS) at the private and public level. The Ph.D. in Unmanned Systems Applications will provide new opportunities for partnerships as well as research worldwide. While additional enrollment will increase financial resources, additional partnerships and grants in this field of study will help diversify and increase financial resources.

B. Critical and compelling regional or statewide need as identified in the State Plan:

1. **Demonstrate demand and need for the program in terms of meeting present and future needs of the region and the state in general based on one or more of the following:**

a. **The need for advancement and evolution of knowledge.**

Advanced technologies are redefining every facet of business, industry, and personal life at a rapid pace in a highly competitive, global environment. Top level leaders in Unmanned Systems are at the forefront of this evolution in a quickly growing field. Leaders with a doctorate degree in Unmanned Systems Applications possess the ability to lead, influence, and inspire the technology revolution with the following skills:

- Envision, plan and conduct original research on Unmanned Systems development activities;
- Identify, comprehend, analyze, evaluate and synthesize research at the highest level;
- Evaluate technologies and technology-related programs for library science;
- Assess individual performance with, and an understanding of, Unmanned Systems;
- Communicate effectively and employ constructive professional and interpersonal skills; and
- Function at the highest level within the interdisciplinary field of Unmanned Systems.

Maryland has a long history of fostering and encouraging entrepreneurs to launch and maintain technology-based ventures as well as groundbreaking research in technology. If approved, this new degree will build on that legacy with a groundbreaking new doctoral program in an interdisciplinary field.

i. **Unmanned Systems skills will be in demand.**
The Association for Unmanned Vehicle Systems International (AUVSI)'s economic impact report of 2013 just on the Unmanned Aircraft Systems Integration not including ground and water systems in the United States report shows the economic benefit of UAS integration. AUVSI's findings show that in the first three years of integration more than 70,000 jobs will be created in the United States with an economic impact of more than $13.6 billion. This benefit will grow through 2025 when we foresee more than 100,000 jobs created and economic impact of $82 billion.

(Source: http://www.auvsi.org/our-impact/economic-report)

ii. **Applicable markets for career growth**
There are a number of different markets in which UAS can be used. This research is concentrated on the two markets, commercial and civil, with the largest potential. A third category (Other) summarizes all other markets:

1. Precision agriculture;
2. Public safety; and
3. Other.

Public safety officials include police officers and professional firefighters in the U.S., as well as a variety of professional and volunteer emergency medical service providers who protect the public from events that pose significant danger, including natural disasters, man-made disasters and crimes. Precision agriculture refers to two segments of the farm market: remote sensing and precision application. A variety of remote sensors are being used to scan plants for health problems, record growth rates and hydration, and locate disease outbreaks. Such sensors can be attached to ground vehicles, aerial vehicles and even aerospace satellites. Precision application, a practice especially useful for crop farmers and horticulturists, utilizes effective and efficient spray techniques to more selectively cover plants and fields. This allows farmers to provide only the needed pesticide or nutrient to each plant, reducing the total amount sprayed, and thus saving money and reducing environmental impacts. As listed above, a large number of other markets will also use UAS once the airspace is integrated. We believe the impact of these other markets will be at least the size of the impact from public safety use. With sensible regulations in place, we foresee few limitations to rapid growth in these industries. These products use off-the-shelf technology and thus impose few problems to rapidly ramping up production. The inputs (i.e., parts) to the UAS can be purchased from more than 100 different suppliers; therefore, prices will be stable and competitive. The inputs to the UAS can all be purchased within the U.S., although these products can be imported from any number of foreign countries without the need of an import license. UAS have a durable life span of approximately 11 years and are relatively easy to maintain. The manufacture of these products requires technical skills equivalent to a baccalaureate degree. Therefore, there will always be a plentiful market of job applicants willing to enter this market. In summary, there are no production problems on the horizon that will impact the manufacturing and output of this product. Most of the barriers of potential usage are governmental and regulatory. For this study, we assume necessary airspace integration in 2015, on par with current legislation. Covering and justifying the cost of UAS is straightforward. In the precision agriculture market, the average price of the UAS is a fraction of the cost of a manned aircraft, such as a helicopter

or crop duster, without any of the safety hazards. For public safety, the price of the product is approximately the price of a police squad car equipped with standard gear. It is also operated at a fraction of the cost of a manned aircraft, such as a helicopter, reducing the strain on agency budgets as well as the risk of bodily harm to the users in many difficult and dangerous situations. Therefore, the cost-benefit ratios of using UAS can be easily understood.

UAS are already being used in a variety of applications, and many more areas will benefit by their use, such as:

• Wildfire mapping
• Agricultural monitoring;
• Disaster management;
• Thermal infrared power line surveys;
• Law enforcement;
• Telecommunication;
• Weather monitoring;
• Aerial imaging/mapping;
• Television news coverage, sporting events, moviemaking
• Environmental monitoring;
• Oil and gas exploration; and
• Freight transport.

(Source: http://www.auvsi.org/our-impact/economic-report)

b. **Societal needs, including expanding educational opportunities and choices for minorities and educationally disadvantaged students at institutions of higher education.**

Capitol Technology University has a long history of serving the minority population. The university has a 51% minority student population with 7% undisclosed. Thirty-four percent of the university's minority population is African American.

Millennials (also known as Generation Y) have been entering the workforce in record numbers for the past ten years and having been coming to terms with the relevance of their higher education degrees as well as their level of job satisfaction. Forbes.com recently recognized the trend in its article, "4 Reasons To Make A Career Pivot To Tech In 2017."

Technology fields are a key to success for Millennials
"The number of millennials making the leap from their current field into a technology job is on the rise and for good reason. Job opportunity has and will be exceptional for tech job seekers, along with the ability to expand skills, be challenged, and earn a higher income."

"'…tech is probably the single greatest opportunity that exists for millennials today,'" Mark Smukler, General Assembly alumni and Co-Founder of Bixby, a rental management platform. 'There's still a large shortage of technical expertise across most industry verticals and a career in tech can be one of the most rewarding jobs in many ways.'"

Employers are scouring universities looking to hire technology
"For millennial professionals who are eyeing up a career change to tech, there has never been a better time to make the leap. Between a shortage of qualified candidates and the competition that naturally comes with job-hoppers, finding a great job in the field has become much easier."

"'This market is booming,' said Eric Haller, Executive Vice President & Global Head of Experian DataLabs, an innovative data analysis company. 'Finding talent is a challenge and employers are starting to swarm the universities that are producing those they think are trainable or can come in the door ready to work. The supply/demand equation favors those on the supply side right now and it looks to be that way for some time to come.'"

(Source: https://www.forbes.com/sites/kaytiezimmerman/2016/12/20/4-reasons-to-make-a-career-pivot-to-tech-in-2017/#bd145a37b8ec)

"Economic projections point to a need for approximately 1 million more STEM professionals than the U.S. will produce at the current rate over the next decade if the country is to retain its historical preeminence in science and technology."

[Source: President's Council of Advisors on Science and Technology, *Engage to excel: producing one million additional college graduates with degrees in science, technology, engineering, and mathematics* (Executive Office of the President of the United States, 2012)]

The National Science Foundation (NSF) outlined labor growth of 23.1% between 2010 and 2020. Such growth represents 59% of the total growth of US science and engineering jobs[1].

(Source: https://www.nsf.gov/nsb/sei/edTool/data/workforce-03.html)

Fortune magazine, in analyzing available labor market data and employer needs, found that graduate degrees (including the Ph.D.) ranked the highest in pay, satisfaction, and long-term job growth outlook.

(Source: http://fortune.com/2016/03/21/best-worst-graduate-degrees-jobs-2016/)

c. **The need to strengthen and expand the capacity of historically black institutions to provide high quality and unique educational programs.**

The industry watchdog Diverse: Issues In Higher Education serves as a source of critical news, information and insightful commentary on the full range of issues concerning diversity in American higher education. The group cites recent U.S. Bureau of Labor Statistics information regarding the inequity of high paying jobs in technology. "Yet, women and minorities are not accessing these jobs at anywhere near a proportionate rate. For instance, a report from the Business-Higher Education Forum notes that African Americans and Hispanics represent just 6 and 7 percent of STEM employment, even though they represent more than twice that much of the U.S. population."

Given the substantial minority population of Capitol Technology University, it is reasonable to

assert that the Ph.D. in Unmanned Systems Applications program will add to this base of minority participation.

2. **Provide evidence that the perceived need is consistent with the Maryland State Plan for Postsecondary Education.**

The 2013-2017 Maryland State Plan for Postsecondary Education articulates six goals for postsecondary education:

1. Quality and Effectiveness
2. Access, Affordability, and Completion
3. Diversity
4. Innovation
5. Economic Growth and Vitality
6. Data Use and Distribution

Goal 1

The Ph.D. in Unmanned Systems Applications program, with its rigor, will produce highly qualified technology professionals for the evolving field of Unmanned Systems. The university has a proven record of quality education. In addition to regional accreditation, the Association of Technology, Management, and Applied Engineering (ATMAE) accredits technology, management, and applied engineering degrees. The Ph.D. in Unmanned Systems Applications program is consistent with the ATMAE criteria for the delivery of high quality technology, management, and applied engineering education. The Ph.D. in Unmanned Systems Applications program is consistent with the ATMAE criteria for the delivery of high quality technology, management, and applied engineering education. Faculty and staff are engaged in faculty development to remain current in their field of teaching as well as to expand knowledge across disciplines. The university has in place services and learning tools to guide students to successful degree completion. Programs such as Early Alert provide staff and faculty opportunities for early student intervention on the pathway to graduation. This applies to all students regardless of mode of course delivery. Capitol Technology University is a transfer friendly institution and participates in multiple programs for government and military credit transfer. The university has multiple transfer agreements with local institutions at all degree levels.

Goal 2

The courses for the Ph.D. in Unmanned Systems Applications will be offered in the online format. This provides learning opportunities for students unable or unwilling to attend an on-campus institution of higher education. The University provides a tuition structure that is competitive with its competitors. The University tuition structure does not differentiate between in-state and out-of-state students. Student services are designed to provide advising, tutoring, virtual job fair attendance, and other activities supporting student completion and employment for both on-ground and online students.

Students receive information through admissions regarding the cost to attend the university. The information is also publicly available on the university website. Admissions and financial aid identify for the student potential grants, scholarships, and state plans to reduce potential student debt. The net cost versus gross costs are identified clearly for the student. Students receive advising from financial aid prior to enrolling in classes for the first time. Admissions, student

services and departmental chairs advise students as to academic readiness and degree requirements. The specific success pathway is developed for each student.

The university's tuition increases have not exceeded 3%.

The university has in place services, tutoring, and other tools to help ensure student graduation and successful job placement. The university hosts a career (job) fair twice a year. The university has an online career center available to all students covering such topics as career exploration, resume writing, job search techniques, social media management, mock interviews, and assistance interpreting job descriptions, offers, and employment packages.

The university works with its advisory boards, alumni, partners, and faculty to help ensure that the degrees offered at the university are compatible with long term career opportunities in support of the state's knowledge based economy.

Goal 3

The Capitol Technology University community is committed to creating and maintaining a mutually respectful environment that recognizes and celebrates diversity among all students, faculty, and staff. The university values human differences as an asset and works to sustain a culture that reflects the interests, contributions, and perspectives of members of diverse groups. The university delivers educational programming to meet the needs of diverse audiences. We also seek to instill those values, understanding, and skills to encourage leadership and service in a global multicultural society.

The university supports various clubs that identify with diverse groups including race, gender, military/veterans, and sexual orientation. The university has a 51% minority student population with 7% undisclosed. The university's Black/African American population is 34% of the student body. The university has military/veteran population of 22%. The university also has a 17% female population -- a significant percentage given the institution is a technology university.

Achievement gaps: The university provides leveling courses in support of individuals attempting a career change to a field of study not necessarily consistent with their current skills. There are situations where additional graduate courses best serve student needs in subject areas. The university makes those courses available.

The university engages in diversity training for its institutional population, including students. Diversity and inclusiveness are built in to the curriculum allowing graduates to operate effectively in a global environment. The university supports such things a team projects and grants across degrees. This has proven effective at supporting multiple aspects of diversity.

Goal 4

Capitol Technology University's past, present, and future is inextricably intertwined with innovation. The university has a long tradition of serving as a platform for the use of new and transformative approaches to delivering higher education. New technology and cutting-edge techniques are blended with proven strategies with the goal of enabling student success in the classroom as well as in a successful career after graduation. As a small institution, Capitol Technology University can quickly integrate new technologies into the curriculum to better

prepare students for the work environment. The university designs curriculum in alliance with accreditation and regulating organizations/agencies.

The university employs online virtual simulations in a game-like environment to teach practical hands-on application of knowledge. The university is engaged with a partner creating high level virtual reality environments for some courses in the degree. This all occurs in parallel with traditional proven learning strategies. These elements of the university learning environment are purposeful and intended to improve the learning environment for both the student and faculty member. In addition, these elements are purposely designed to increase engagement, improve outcomes, and improve retention and graduation rates. The university believes that innovation is the key to successful student and faculty engagement.

Example: The university engages its students in "fusion" projects, which allows students to contribute skills in interdisciplinary projects such as those in our astronautical engineering and cyber labs where business students become project managers (e.g., to send a CubeSAT on a NASA rocket) and data analysts (e.g., to analyze rainforest data for NASA). We are recruiting partners for this potential degree for which real projects will provide students integrative learning opportunities.

The university supports transfer of a limited number of graduate level courses appropriate to the degree. The university has some agreements with articulation partners for the transfer of graduate work (e.g., National Defense University).

Goal 5

One of the overarching principles of Capitol Technology University's approach to education is to instill a zeal for life-long learning in our students, which promotes economic growth and vitality of the student. The field of Unmanned Systems Applications inherently supports a knowledge-based economy. The university's partnerships, both current and future, will provide economic growth opportunities for students, the university, and our partners. The university's Ph.D. in Business Analytics and Decision Sciences, D.Sc. in Cybersecurity, and the Ph.D. in Technology provide opportunities for doctoral students to engage in high level research partnerships. The university is committed to partnering with Maryland institutions to employ our graduates and keep the talent in the state. The university instills in students an entrepreneurial attitude preparing them to bring skills to startup businesses or start a business of their own.

Goal 6

Capitol Technology University is committed to data collection and disclosure beyond the requirements of regulations and accreditation. Data is publicly available on the university website. Assessment for the university is the responsibility of the Vice President of Academic Affairs. Highly skilled personnel are required in a timely manner to accumulate the data, analyze the data, distribute the results, and recommend potential decisions to achieve the desired outcomes. In addition, data is evaluated by the University Academic Dean, department chairs, faculty, advisory boards, trustees, university executives, etc. to make the best decision possible.

C. Quantifiable & reliable evidence and documentation of market supply and demand in the region and State:

1. **Present data and analysis projecting market demand and the availability of openings in a job market to be served by the new program.**

   The World Economic Forum, an international organization for public-private cooperation, defined the pressing need for technology professionals in an article, "8 Jobs Every Company Will Be Hiring for by 2020":

   > The report, called "The Future of Jobs," surveyed executives from more than 350 employers across nine industries in 15 of the world's largest economies to come up with its predictions about how the labor markets will evolve.
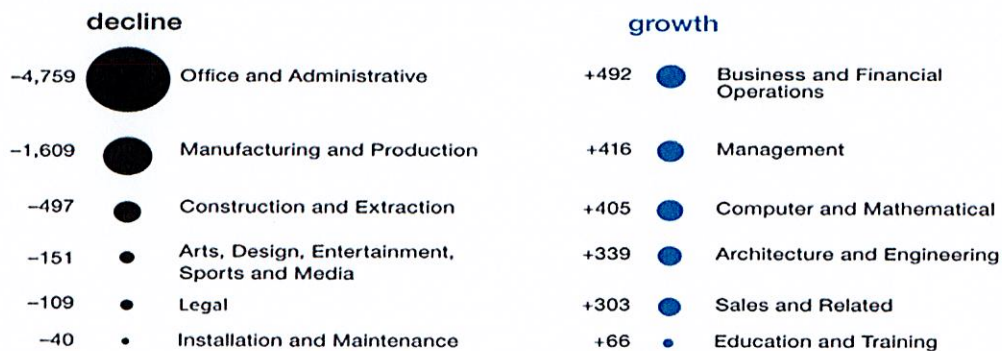   >
   > While the job landscape is expected to undergo radical changes over the next few years, the report predicts that there will also be certain occupations that are more in demand. Here's a look at some of the job categories that are expected to see growth.
   >
   > **1. Data analysts will be in demand.**
   > According to the report, data analysts will become increasingly more important in all industries by 2020. Survey respondents said they expect to have a greater demand for data analysts because they will need help making sense of all of the data generated by technological disruptions.

   WORLD
   ECONOMIC
   FORUM
   COMMITTED TO
   IMPROVING THE STATE
   OF THE WORLD

Employment outlook across job families
jobs change in thousands, 2015-2020

decline		growth	
−4,759	Office and Administrative	+492	Business and Financial Operations
−1,609	Manufacturing and Production	+416	Management
−497	Construction and Extraction	+405	Computer and Mathematical
−151	Arts, Design, Entertainment, Sports and Media	+339	Architecture and Engineering
−109	Legal	+303	Sales and Related
−40	Installation and Maintenance	+66	Education and Training

Across major economies - see report for full list.
Source: Future of Jobs Report, World Economic Forum

   > **2. In fact, computer and mathematical jobs as a whole will also continue to get a boost.**
   > Jobs that fall under the computer and mathematical occupations will grow.

These occupations include computer programmers, software developers, information security analysts, and more.

3. Architects and engineering jobs will remain stable.
During the next four years, the demand for those skilled in architecture and engineering will continue to increase. Specifically, the report states there will be growth for engineers focused on biochemicals, nanotechnology, robotics, and materials.

By 2020, 2 million jobs will be created worldwide that fall under computer and mathematical and architecture and engineering related fields, according to the report.

(Source: https://www.weforum.org/agenda/2016/01/8-jobs-every-company-will-be-hiring-for-by-2020/)

2. **Discuss and provide evidence of market surveys that clearly provide quantifiable and reliable data on the educational and training needs and the anticipated number of vacancies expected over the next 5 years.**

"If you want to pull in a six-figure salary right out of school, you might want to start studying unmanned aircraft systems, more commonly and controversially known as drones. The young field is already lucrative—$11.3 billion globally—and set to grow exponentially. The Association for Unmanned Vehicle Systems International, a trade organization, predicts that the global market will be $140 billion in 10 years."

(Source: http://www.slate.com/blogs/business_insider/2014/09/24/drone_college_new_under graduate_degrees_in_unmanned_aircraft_systems_pay.html)

"The high salaries [for unmanned and autonomous systems personnel] relate to the specialization and travel that comes with the job. 'If it involves overseas deployment, starting salary is close to six figures, $80,000 plus deployment pay, an additional compensation package for being deployed and having to spend six months out of the year sequestered away in Afghanistan,' (Kurt) Barnhart says. Domestic jobs — with startup companies like Roboflight or Precision Hawk—start at about $60,000 a year. Compare that with first-year pilots of conventional aircraft; they start out at as low as $21,000 a year.

Philip Ellerbroek, Roboflight's global director of sales, says that charting a career in UAS requires understanding the facets of the field. You could design the hardware itself, train in piloting the aircraft, or write software code to make the whole thing work. You also have to factor in scale of the vehicle itself: Flying a hobbyist plane won't require a degree, but if you want to pilot a $4 million military device like a Predator, you need specialization."

(Source: http://www.slate.com/blogs/business_insider/2014/09/24/drone_college_new_under graduate_degrees_in_unmanned_aircraft_systems_pay.html)

"While most of the news about UAS centers around their military applications, experts say the growth is going to come through private work in the US, whether it's farmers inspecting fields, meteorologists investigating hurricanes, or construction workers surveying sites."

(Source: http://www.slate.com/blogs/business_insider/2014/09/24/drone_college_new_under graduate_degrees_in_unmanned_aircraft_systems_pay.html)

The following is a sample business case for an effective use of Unmanned and Autonomous Systems to increase a farmer's yield and profits.

"Agriculture Business Start-up: Crop farming in the USA makes an annual profit of $150 billion. One of the major expenses is chemical application. Chemicals consist of fertilizer, pesticides, fungicides and herbicides. If the amount of chemical usage can be reduced, farmers' profits will increase. A UA/Drone can use specialized sensors to discover non-fertile areas, plant disease and weed infestations. Instead of applying chemicals to the entire farm, only apply chemicals to affected areas detected by a UA/Drone. A total of $26 billion is spent on fertilizer every year. If UA/Drone usage can save 30%, an increase of $8.7 billion in profits can be realized. A very cheap off-the-shelf vegetation stress camera (like the XNiteCannonSX230NDVI 12 megapixel with GPS) can easily be mounted on a UA/Drone to capture a Normalized Difference Vegetation Index (NDVI) image."

(Source: http://www.uxvuniversity.com/uapa/)

"It sounds futuristic: a drone carrying a defibrillator swooping in to help bystanders revive someone stricken by cardiac arrest.

Researchers tested the idea and found that drones arrived at the scene of 18 cardiac arrests within about 5 minutes of launch. That was almost 17 minutes faster, on average, than ambulances — a big deal when minutes mean life or death.

Cardiac arrest is a leading cause of death worldwide, killing more than 6 million people each year. Most cases happen at home or in other non-medical settings, and most patients don't survive.

'Ninety percent of people who collapse outside of a hospital don't make it. This is a crisis, and it's time we do something different to address it,' said the cardiology chief at Northwestern University's medical school.

[R]esearchers reached the same conclusion after analyzing cardiac arrest data in Sweden, focusing on towns near Stockholm that don't have enough emergency medical resources to serve summer vacationers. The analysis found an emergency response time of almost 30 minutes and a survival rate of zero, said lead author Andreas Claesson, a researcher at the Center for Resuscitation Science at Karolinska Institute in Stockholm.

Heart attacks occur when a clot or other blockage stops blood flow to the heart. Cardiac arrest occurs when electrical impulses controlling the heart's rhythmic pumping action suddenly malfunction. The heartbeat becomes very irregular or stops, preventing blood from reaching vital organs. Death can occur within minutes without treatment to restore a normal heartbeat, ideally CPR and use of a defibrillator.

The researchers used a small heart defibrillator weighing less than two pounds, with an electronic voice that gives instructions. It was attached to a small drone equipped with four propeller-like rotors, a global positioning device, and a camera.

'Drones are increasingly being tested or used in a variety of settings, including to deliver retail goods in remote areas, search for lost hikers, and help police monitor traffic or crowds. Using them to speed medical care seemed like a logical next step...'"

(Source: https://www.bostonglobe.com/business/2017/06/13/drones-with-defibrillators-could-soon-fly-rescue-cardiac-arrests/X6kfwxjsR1jN5cv3acLtwO/story.html)

"Like the internet and GPS before them, drones are evolving beyond their military origin to become powerful business tools. They've already made the leap to the consumer market, and now they're being put to work in commercial and civil government applications from firefighting to farming. That's creating a market opportunity that's too large to ignore.

Between now and 2020, we forecast a $100 billion market opportunity for drones—helped by growing demand from the commercial and civil government sectors.

Drones got their start as safer, cheaper and often more capable alternatives to manned military aircraft. Defense will remain the largest market for the foreseeable future as global competition heats up and technology continues to improve.

The consumer drone market was the first to develop outside the military. Demand has taken off in the last two years and hobbyist drones have become a familiar sight, but there is plenty of room for growth.

The fastest growth opportunity comes from businesses and civil governments. They're just beginning to explore the possibilities, but we expect they'll spend $13 billion on drones between now and 2020, putting thousands of them in the sky."

DRONES AT WORK: BUSINESS & CIVIL GOVERNMENT

Drones are already generating climate data, monitoring the borders and more—and they're just scratching the surface of their commercial potential.

THE JOB OPPORTUNITIES
Total Addressable Market by Industry/Function
(Millions of Dollars)

• Construction	$11,164
• Agriculture	$5,922
• Insurance Claims	$1,418
• Offshore Oil/Gas and Refining	$1,110
• Police (US)	$885
• Fire (US)	$881
• Coast Guard (US)	$511
• Journalism	$480
• Customs and Border Protection (US)	$380
• Real Estate	$265
• Utilities	$93
• Pipelines	$41
• Mining	$40
• Clean Energy	$25
• Cinematography	$21

Source: Goldman Sachs Research

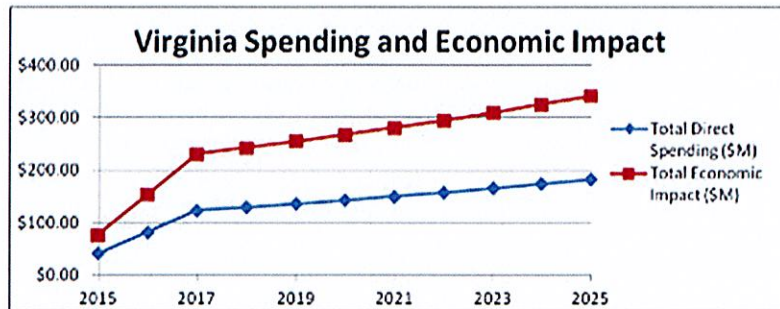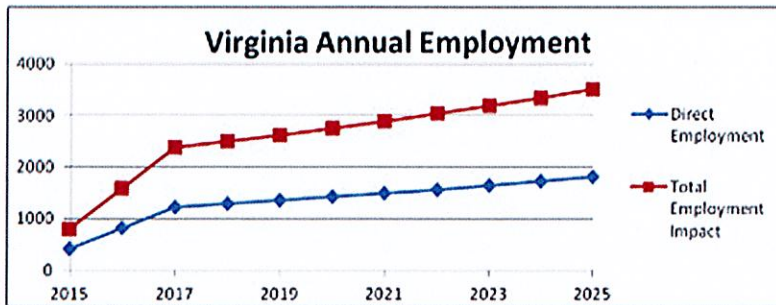(Source: http://www.goldmansachs.com/our-thinking/technology-driving-innovation/drones/)

The Association for Unmanned Vehicle Systems International (AUVSI) provided a recent economic impact report that indicates the financial impact to the region.

			Maryland Economic Impact			
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	296	575	$29.33	$55.91	$439.20	
2016	592	1150	$58.67	$111.83	$878.39	100%
2017	888	1725	$88.00	$167.74	$1,317.59	50%
2018	932	1812	$92.40	$176.13	$1,383.46	5%
2019	979	1902	$97.02	$184.93	$1,452.64	5%
2020	1028	1997	$101.87	$194.18	$1,525.27	5%
2021	1079	2097	$106.97	$203.89	$1,601.53	5%
2022	1133	2202	$112.31	$214.08	$1,681.61	5%
2023	1190	2312	$117.93	$224.79	$1,765.69	5%
2024	1249	2428	$123.83	$236.02	$1,853.98	5%
2025	1311	2549	$130.02	$247.83	$1,946.67	5%

Maryland Annual Employment

Maryland Spending and Economic Impact
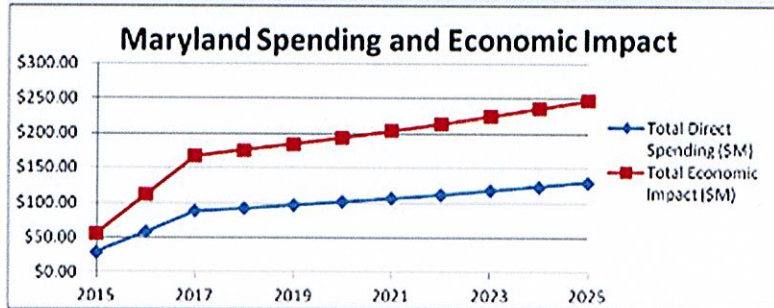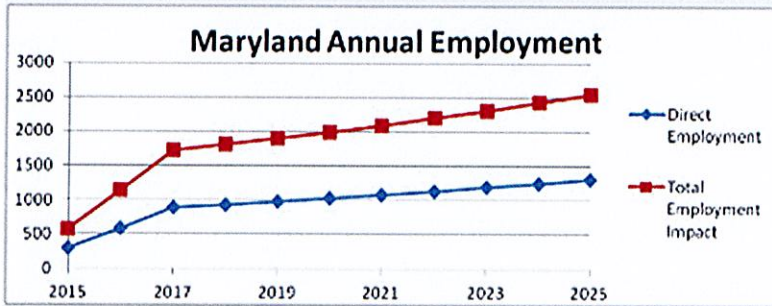
Virginia Economic Impact						
Year	Direct Employment	Total Employment Impact	Total Direct Spending ($M)	Total Economic Impact ($M)	Total State Taxes ($K)	Percent Change Over Previous Year
2015	408	793	$41.21	$77.14	$744.50	
2016	816	1587	$82.41	$154.28	$1,489.00	100%
2017	1225	2380	$123.62	$231.42	$2,233.51	50%
2018	1288	2499	$129.80	$242.99	$2,345.18	5%
2019	1350	2624	$136.29	$255.14	$2,462.44	5%
2020	1418	2756	$143.11	$267.89	$2,585.56	5%
2021	1489	2893	$150.26	$281.29	$2,714.84	5%
2022	1563	3038	$157.77	$295.35	$2,850.58	5%
2023	1641	3190	$165.66	$310.12	$2,993.11	5%
2024	1723	3349	$173.95	$325.63	$3,142.77	5%
2025	1809	3517	$182.64	$341.91	$3,299.90	5%

Virginia Annual Employment

Virginia Spending and Economic Impact

(Source: http://www.auvsi.org/our-impact/economic-report)

3. **Data showing the current and projected supply of prospective graduates.**

There has been dramatic growth throughout the United States in the numbers and use of unmanned aircraft during recent years. The commercial and military impact UAV's will have in the coming years is very significant, creating more than 100,000 new jobs by 2025, with an economic impact of $82 billion, according to a 2013 report by the Association for Unmanned Vehicle Systems International (a group representing 7,500 individual members and 600 corporations). The U.S. budget for drone warfare has increased from $667 million in 2002 to more than $3.9 billion, according to the Congressional Research Service. And the number of drones in military service has increased from 167 to nearly 7,500.

(Source: https://successfulstudent.org/15-best-drone-training-colleges/)

Analysts at PricewaterhouseCoopers predicted last year that the global market for commercial applications of drone technology could reach $127 million by 2020, rather than 2025 as predicted by the Association for Unmanned Vehicle Systems International (AUVSI).

(Source: https://www.theatlantic.com/technology/archive/2017/01/drone-pilot-school/515022/)

According to the Maryland Department of Commerce report, "UAS and Maryland Accountability document, A Report Connected to the Unmanned Aircraft Systems Research Development, Regulation and Privacy Act of 2015," the AUVSI estimate in 2013 for the number of available jobs for manufacturing alone in by 2025 would be 34,000. The AUVSI organization now anticipates 100,000 jobs in UAS manufacturing alone within a decade of airspace integration.

(Source: http://www.flyingmag.com/careers/growing-job-demand-unmanned-aerial-systems#page-2)

According to the Maryland Department of Commerce report, Maryland has an impressive base of aerospace and UAS companies, ranking fourth nationally in the number of firms, following California, Florida and Virginia. The broader Maryland/Virginia region combined represents an even stronger concentration. Many area firms have been active in the Defense UAS market since its inception and are investing in developing commercial capabilities. Among the larger players are Lockheed and Northrup Grumman, which house complementary UAS functions in the state. Maryland also has a robust start-up environment in modeling, simulation and big data analytics, an integral piece of the Unmanned and Autonomous Systems world. (Note: This is consistent with the existing and new analytics studies opportunities at Capitol.)

Career opportunities for students with drone training include military drone pilot, firefighter, disaster relief, search and rescue, law enforcement, oil and gas operations, seismic study, border patrol, traffic reporting, storm chasing, agriculture, package delivery, forestry, engineering, computer science, commercial contractors, film, and other industries. Companies that hire drone engineers and pilots include aerospace and defense companies Northrop Grumman and Lockheed Martin, and aircraft manufacturer Boeing. NASA is currently working on an air traffic control system for drones, and online retail giant Amazon is ready to deliver packages via drones.

(Source: https://successfulstudent.org/15-best-drone-training-colleges/)

Unmanned systems can be a critical part of an emergency management system: Per FEMA, "FEMA staff should review pre-disaster maintenance or inspection reports to verify pre-disaster conditions and to assess eligible disaster damage for facilities that require routine maintenance to maintain their designated function before allocating any money for recovery." Given the dynamics of disaster relief, evidence is required of the pre-disaster status of an area. If your community does not have the documentation to prove that all damage was caused by the disaster (and not a result of pre-existing conditions), then your community could be left without the needed recovery funds from the FEMA public assistance program. Drones can be utilized to fly over key infrastructure to document pre-disaster conditions via video and image capture either annually or right before a known storm to ensure that your community has the necessary documentation for FEMA. This could be key to thousands of dollars, if not more in some situations.

(Source: http://www.cdrmaguire.com/why-drones-are-valuable-to-your-emergency-management-plan/)

Companies such as Amazon and Google are testing ways to deliver packages via drone in the future.

In an economic impact assessment two years ago, AUVSI projected more than $2 billion in economic gains and more than 2,700 new UAS-related jobs in Ohio and an $82 billion market and 100,000 jobs in the United States within 10 years once drones are flying under Federal Aviation Administration rules.

(Source: http://www.govtech.com/budget-finance/Drone-Related-Job-Growth-to-Outpace-Predictions.html)

Interest groups are banding together for permissions to use drones.

The movie makers have been joined by groups like the National Association of Broadcasters and National Association of Realtors wanting permission to use drones as a platform for photography, according to the records.

An association representing rural and farming interests, the National Grange of the Order of Patrons of Husbandry, began lobbying in favor of greater drone use in agriculture and other applications last year, according to its reports.

(Source: https://www.bloomberg.com/news/articles/2014-05-12/filmmakers-to-farmers-seeking-drone-bonanza-in-washington?cmpid=mashable)

D. Reasonableness of program duplication:

1. **Identify similar programs in the State and/or same geographical area. Discuss similarities and differences between the proposed program and others in the same degree to be awarded.**

   Only the Community College of Baltimore County has an Associate of Applied Science degree in Unmanned Aircraft Systems. This is a degree that is primarily limited to becoming an unmanned systems pilot; the degree does not focus on understanding the use and application of unmanned systems across all industries using "drones" in the air, on land, and in the water. There are no other programs in Maryland with a Ph.D. in Unmanned Systems Applications – a specific interdisciplinary field of endeavor.

   Capitol Technology University's **Doctor of Philosophy in Unmanned Systems Applications is unique in its focus on earning a doctorate -- through deep research in the fields of Unmanned Systems Applications -- and the subsequent publication of the material in high level peer-reviewed scholarly journal. The university's Doctor of Philosophy in Unmanned Systems Applications does not follow the normal doctoral model of combining coursework with a dissertation.** Instead, the doctoral student is required to be an expert in unmanned systems or a field of related technology and able to produce technical literary works at the highest levels of scholarly excellence.

   The Doctor of Philosophy in Unmanned Systems Applications requires 60 credits to graduate. Capitol Technology University's program is delivered online (using the Canvas Learning Management System as well as Adobe Connect).

2. Provide justification for the proposed program.

The program is strongly aligned with the university's strategic priorities and is supported by adequate resources. The new Ph.D. in Unmanned Systems Applications will strengthen and expand upon existing graduate degree programs at the university. The degree will represent study in a rapidly changing and expanding discipline. Research shows a current and growing shortage of highly capable Unmanned Systems leaders who are experts in technology directly related to their profession. There is a thorough discussion of the need in sections B and C of this document.

E. Relevance to high-demand programs at Historically Black Institutions (HBIs):

1. Discuss the program's potential impact on the implementation or maintenance of high-demand programs at HBIs.

The university is not aware of any similar high-demand programs at the Maryland HBIs.

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

1. Discuss the program's potential impact on the uniqueness and institutional identities and missions of HBIs.

The university is not aware of any impact on the uniqueness and institutional identities and missions of Maryland HBIs.

G. Adequacy of curriculum design and delivery to related learning outcomes consistent with Regulation .10 of this chapter:

1. Provide a list of courses with title, semester credit hours and course descriptions, along with a description of program requirements.

Program description, as it will appear in the catalog:

Doctor of Philosophy in Unmanned Systems Applications Program Description:

The Doctor of Philosophy in Unmanned Systems Applications provides students with the opportunity to conduct extensive and sustained original research in the fields of Unmanned Systems Applications. Capitol Technology University is in a unique position to provide students with an avenue to pursue a deep proficiency in both fields using an interdisciplinary methodology. Graduates will contribute significantly to their chosen field through the creation of new knowledge and ideas. Further, as a doctorate by research, students will quickly be able to engage in research and publishing without the need to navigate the limitations inherent in traditional coursework models.

The Doctor of Philosophy in Unmanned Systems Applications will prepare the students to take roles as leaders in the Unmanned Systems fields. The student will begin their path to success by working with a research committee from Capitol Technology University to develop a research proposal. The student will then work independently to conduct the study and produce a meaningful body of original research of publishable quality. In addition to the technology, students will be able to defend their knowledge of the legal, political, ethical, and social dimensions of their field of research. The Ph.D. in Unmanned Systems Applications will prepare students to achieve a more profound understanding within the interdisciplinary field of Unmanned Systems.

The Doctor of Philosophy in Unmanned Systems Applications is designed for students with an appropriate Master's degree. The Doctor of Philosophy in Unmanned Systems Applications degree begins at the doctoral level with students conducting original research in an approved topic of Unmanned Systems. Successful completion of the program culminates in the award of the Doctor of Philosophy in Unmanned Systems Applications degree.

There are two options for completion of the Doctor of Philosophy in Unmanned Systems Applications program:

Dissertation Option: the student will produce, present, and defend a doctoral dissertation after receiving the required approvals from the student's Committee and the Ph.D. Review Board.

Publication Option: the student will produce, present, defend their original doctoral research after receiving the required approvals from the student's Committee and the Ph.D. Review Board. The student must also publish three works of original research in a scholarly peer-reviewed journal(s) of high stature.

Description of program requirements:

Entrance requirements:

Entrance Requirements

To be accepted into the Ph.D. in Unmanned Systems Applications program, students must have completed an appropriate Master's degree with a cumulative GPA of no less than 3.0 on a 4.0 scale. Students must also possess a high level of expertise in a field of technology and show the academic promise of their future ability to produce original research of publishable quality (suitable for a scholarly peer-reviewed journal of high stature). Students must also provide a prospectus of at least 750 words that details their technological expertise and preparation for success in conducting original research within Capitol Technology University's Ph.D. in Unmanned Systems Applications program. International students are required to take the TOEFL and score at least 550 on the paper-based test or 79 on the internet-based test.

PhD in Unmanned Systems Applications Courses
(60 credits)

TEC 800 - Writing the Doctoral Proposal I (6 credits)
Project I. The student and the student's Committee will work to produce a proposal for research that is comprehensive in detail and planning. The proposal will address the research topic, scope and aims, objectives and a timing plan. Further, the skill set of the student will be evaluated by the committee and recommendations may be made to the PhD Review Board to address deficiencies. Prerequisite: Admittance to Track II.

TEC 810 - Writing the Doctoral Proposal II (6 credits)
Project II. The student will work to complete research milestones related to chapter one of their research according to the proposal and research plan. The prospective chapter will be reviewed by

the student's Committee for approval prior to advancing to the next phase in the program. Prerequisite: TEC 800.

TEC 820 - Writing the Doctoral Proposal III (6 credits)
Project III. The student will undertake a robust and comprehensive literature review, equivalent in scope and aim to a dissertation chapter two, within the boundaries of the proposal and research plan. The prospective chapter will be reviewed by the student's Committee for approval prior to advancing to the next phase in the program. Prerequisite: TEC 810.

TEC 830 - Writing the Doctoral Proposal IV (6 credits)
Project IV. Students will complete the research milestones associated with chapter three of the research. Further, students will finalize Institutional Review Board and Academic Review Board documentation. All research materials will be reviewed by the student's Committee and, upon reaching approval consensus, the committee will notify the PhD Review Board of the student advancing to proposal oral defense status. Prerequisite: TEC 820.

TEC 840 - Doctoral Proposal Oral Defense (6 credits)
Project V. Upon approval from the Institutional Review Board, Academic Review Board, and PhD Review Board, the student will prepare a presentation for oral defense of the research proposal, research plan, and initial chapters of the dissertation. The PhD Review Board and Dissertation Committee will evaluate both the student's proposal oral defense as well as the student's potential to complete the next phases of original research. Prerequisite: TEC 830.

TEC 900 – Doctoral Research Preparation I (6 credits)
Project VI. After receiving the necessary approvals, the student will conduct data collection and analysis activities consistent with the research plan. A complete and substantive presentation of the research results will be produced, equivalent to a dissertation chapter four. The student's Committee will review and approve related research materials. Prerequisite: TEC 840.

TEC 910 - Doctoral Research Preparation II (6 credits)
Project VII. The student will compose a draft research document in the appropriate form consisting of five chapters and submit the draft to the student's Committee. The student's Committee will review and approve related research materials. The student will make any required changes. Prerequisite: TEC 900.

TEC 920 – Doctoral Research Preparation III (6 credits)
Project VIII. The student will finalize the research document consisting of five chapters. The student's Committee will submit chapters four and five to university reviewers for approval. During Project VIII, the student is required to make the recommended changes and re-submit to the student's Committee; the student's Committee will re-submit to the university reviewers for final approval. Prerequisite: TEC 910.

TEC 930 – Doctoral Research Preparation IV (6 credits)
Project IX. The student will finalize the research document consisting of five chapters and will submit the document to the student's Committee. Upon review and approval, the student's Committee will notify the PhD Review Board of the student's readiness for oral defense. The student will be responsible for preparing the oral defense and submitting for approval. Prerequisite: TEC 920.

TEC 950 – Doctoral Presentation and Oral Defense (6 credits)
Project X. Upon approval from the PhD Review Board, the student will prepare and deliver an oral presentation summarizing the body of research and defend such through oral examination. The student's committee and PhD Review Board will confer to determine if the student has provided a sufficient and necessary oral defense of the research. Prerequisite: TEC 930.

2. **Describe the educational objectives and intended student learning outcomes.**

   Educational Objectives:

   a. Prepare students to critically analyze problems in Unmanned Systems at the highest level and to identify relevant and useful information to move the field forward and support the attainment of desired outcomes.
   b. Prepare students to think critically by drawing appropriate conclusions from examining the output of methodological applications in the technological environment within unmanned and autonomous systems.
   c. Prepare students to conceptualize, apply and integrate effective qualitative and quantitative research strategies and to develop new information effectively.
   d. Prepare students to take a leadership role in a field of unmanned systems while employing the highest levels of ethics, analytics, decision analysis, data visualization.

   Learning Outcomes:

   Upon graduation:

   a. Graduates will be able produce comprehensive research at the highest level within unmanned systems that is of publishable quality in peer-reviewed scholarly publications of the highest level.
   b. Graduates will be able to demonstrate a mastery of an area of unmanned systems research, ethics of research, the stages of the research process, conceptualization and operationalization of research questions, data collection techniques, analytics, qualitative and quantitative methods, measurement, program evaluation research, and research proposal development.
   c. Graduates will be able to demonstrate and apply in-depth knowledge of the main research designs used in qualitative and quantitative research, conceptual and epistemological issues associated with qualitative and quantitative research design, and advanced qualitative research and quantitative techniques.
   d. Graduates will be able to demonstrate a mastery of the understanding and ability to evaluate the possible economic, social, legal, ethical, and environmental impacts of their technological solutions within unmanned and autonomous systems.
   e. Graduate will be able to demonstrate a mastery of the concepts of probability, common distributions, statistical methods, data analysis, analysis of contingency tables, generalized linear models, linking logit and log-linear methods with generalized linear model, and analysis of discrete data using SAS, R, and Python.
   f. Graduates will demonstrate a mastery of data visualization techniques.

3. **Discuss how general education requirements will be met, if applicable.**

   N/A. This is a doctoral program.

4. **Identify any specialized accreditation or graduate certification requirements for this program and its students.**

   The program will be accredited regionally by Middle States Commission on Higher Education (MSCHE) and the Association of Technology, Management, and Applied Engineering (ATMAE).

5. **If contracting with another institution or non-collegiate organization, provide a copy of the written contract.**

   The university will not be contracting with another institution or non-collegiate organization.

H. Adequacy of articulation:

1. **If applicable, discuss how the program supports articulation with programs at partner institutions.**

   This program does not have articulation partners currently. However, it is expected that articulation will work as it does for the university's current degrees. The university is very active with its transfer partners throughout the state and beyond. The goal of the university is to work with partners to make transfer as seamless as possible and to maximize transfer credits as allowable. There is a dedicated transfer student Admissions Associate to guide this process.

I. Adequacy of faculty resources (as outlined in COMAR 13B.02.03.11):

1. **Provide a brief narrative demonstrating the quality of the program faculty. Include a summary list of faculty with appointment type, terminal degree title and field, academic title/rank, status (full-time, part-time, adjunct) and the course(s) each faculty member will teach.**

   All faculty listed below have been engaged with the university for at least several years. Abu-Ageel, Antunes, Bajwa, Bajracharya, Barker, Butler, Hosseini, Pittman, and Sabbah are fulltime faculty members. All of the doctoral faculty hold terminal degrees. The university leadership is confident in the quality of the faculty and their abilities to provide a learning environment supportive of the goals of the university for student success. Additional doctorally-qualified faculty will be added as needed.

Instructors who will be engaged with Ph.D. in Unmanned Systems Applications are:

INSTRUCTOR	BACKGROUND	COURSES ALIGNED TO BE

		TAUGHT
Dr. Nayef Abu-Ageel Full-time	Ph.D., Electrical and Computer Engineering M.S., Electrical Engineering B.S., Electrical Engineering	TEC 700, TEC 740, TEC 950
Dr. Audrey Andrews Adjunct	D.M. Organizational Leadership M.S. Information Systems Management M.B.A.	TEC 710, TEC 740
Dr. Alex "Sandy" Antunes Full-time	Ph.D., Computational Astrophysics M.S. Astronomy B.S. Astronomy and Physics	TEC 730, TEC 740
Dr. Garima Bajwa Full-time	Ph.D., Computer Science and Engineering M.S., Electrical and Computer Engineering B.S., Electronics and Communication Engineering	TEC 740, TEC 950
Dr. Chandra Bajracharya Full-time	Ph.D., Electrical and Computer Engineering M.S., Applied Computing M.S., Electrical Power Engineering B.E., Electrical Engineering	TEC 740, TEC 950
Dr. Hasna Banu Adjunct	Ph.D. Theoretical Physics M.S. Mathematics B.S. Mathematics	TEC 700, TEC 740
Dr. Helen Barker Full-time	D.M. Organizational Leadership Ph.D. Public Administration and Policy (ABD) M.S. Information Systems Management M.S. Business Administration	All TEC courses
Dr. Richard Baker Adjunct	Ph.D., Information Systems M.S., Computer Science B.S., Mathematics F-4 Pilot	TEC 710, TEC 740
Dr. Malcolm Beckett Adjunct	D.B.A. Quality Systems Management in Homeland Security and Defense M.S. Information Systems Management PMP	TEC 710, TEC 740

Dr. William Butler Full-time	D.Sc. Cyber Security M.S. Strategic Studies B.S. Computer Science NSTISSI No. 4011 CNSSI No. 4012 NSTISSI No. 4015 CNSSI No. 4016	All TEC courses
Dr. Jami Carroll Adjunct	D.Sc. Cyber Security M.S. Cyber Security M.B.A.	All TEC courses
Dr. Emily Darraj Adjunct	D.Sc. Cybersecurity M.S. Information Assurance B.A.	All TEC courses.
Dr. George Hoffman Adjunct	D.B.A. Business Administration M.S. Systems Management B.S. Engineering Technology	All TEC courses
Dr. Soheil Hosseini Full-time	Ph.D., Electrical, Electronics and Communications Engineering	TEC 740, TEC 950
Dr. Mary Margaret Johnson Full -time	Ed.D. MAED CISSP A+ N+	All TEC courses
Dr. Priscilla Lewis Adjunct	D.M. Leadership M.B.A M.P.S Managerial Policy B.S., Economics & Mathematics	All TEC courses
Dr. Brian McElyea Adjunct	Ph.D. Leadership and Organizational Change; Specialization: Knowledge Management	TEC 710, TEC 740
Dr. Jack Ford Adjunct	D.Sc., Cybersecurity M.S., Information Assurance B.S., Computer Science Networking	All TEC courses
Dr. John "Jack" Minogue Adjunct	D.Min., Doctor of Ministry MDiv., Divinity Doctoral Studies, Ethics MA, Theology BA, Philosophy/Minor: Mathematics & Physics	TEC 710, TEC 730, TEC 740

Col. Sam Morgan III, USAF (Ret.) Professor of Practice	M.S. Aerospace, Aeronautical, & Astronautical Engineering B.G.S. General Studies MQ-1 Predator Pilot MQ-9 Reaper Instructor Pilot A-10 Instructor/Evaluator Pilot F-16 Maintenance Officer Military Pilot (T-37, T-38)	TEC 950 (Technical Expert only)
Dr. Ebonese Olfus Adjunct	D.Sc., Cybersecurity B.S., Information Systems	All TEC courses
Dr. Maurice Olfus Adjunct	D.B.A. M.P.A B.A., Accounting	All TEC courses
Dr. Alexander Perry Adjunct	D.Sc. Cyber Security M.S. Computational Mathematics	All TEC courses
Dr. Jason Pittman Full-time	Ph.D. Information Assurance M.S. Network Security B.S. English Literature and Microbiology	All TEC courses
Dr. Gale Pomper Adjunct	D.Sc. Cyber Security M.S. Network Security	All TEC courses
Dr. Eric Sabbah Full-time	Ph.D., Computer Science M.S., Computer Science B.S., Mathematics and Computer Science	TEC 740, TEC 950
Van Horn, H. Adjunct	Ph.D. Technology Management M.S., Network Security M.S., Information Architecture M.S., Business Administration B.S., Special Studies Science	TEC 710, TEC 720, TEC 740
A minimum of 4 Adjunct Faculty with expertise in Unmanned Systems will be hired to support the Ph.D. in Unmanned Systems Applications.	All Adjunct Faculty will have a Ph.D. degree in an appropriate field as well as an M.S. in Library Science or related degree	ALL TEC courses

JUSTIFICATION:

Capitol Technology University's UAS Faculty are leading experts in the UAS and aviation fields:

1. Dr. Richard (Dick) Baker has served as the Chair and a member of Indiana State University's Department of Aviation Technology. The Director of Indiana State University's Center for Unmanned Systems and Human Capital Development, Baker holds a bachelor's degree in Mathematics and master's degree in Computer Science from Indiana State University. He received his doctorate in Information Systems from Nova Southeastern University. Baker has been instrumental in the successful launch of ISU's Center for Unmanned Systems and directs the research and collaboration efforts with strategic partners. Baker brings many years of executive level experience in Information Technology (IT) from companies such as General Motors and Electronic Data Systems (EDS). Prior to entering the academic world, he also had extensive experience in the Aviation industry. Baker served as the Director of Human Factors and Safety for American Airlines where his responsibilities included CRM and safety training for all pilots and flight attendants. He received professional certification in Risk Management from the Transportation Safety Institute. Baker retired as a Colonel from the Indiana National Guard in 2003 where he held command positions including Indiana State Director of Operations, Indiana State Director of Support, 181st Fight Wing Support Group Commander, 181st Mission Support Squadron Commander, and 181st Chief of Supply. During his tenure with the Air Guard, he was a Weapons Systems Officer in the F-4 and worked extensively with airspace issues, rapid response teams for counter-terrorism, the Counterdrug Operations at United States Joint Forces Command, and was a trainer for the Air National Guard's Domestic Preparedness Operations.

2. Col. Sam Morgan III, USAF (Ret.) has served as the Director of Unmanned Systems and an Aviation Instructor at Indiana State University. Col. Morgan has over 26 years of experience in aviation and unmanned systems. During his 24 years as a pilot in the United States Air Force, Col. Morgan served as an A-10 Instructor/Evaluator Pilot, MQ-9 Reaper Instructor Pilot, MQ-1 Predator Pilot, F-16 Maintenance Officer, T-37/T-38 Pilot, Fight Safety Officer, Functional Check Flight Pilot, A-10 IP Flight Commander, Command Post Chief, Emergency Actions Controller, Airborne Jump-certified Battalion Air Liaison Officer, and Air Force ROTC Detachment Commander. He retired from active duty as a Colonel in the U.S. Air Force. Following his retirement from active duty, Col. Morgan continued his work in aviation and unmanned systems as an instructor at Indiana State University.

Capitol Technology University engages adjuncts who are deemed subject matter experts in related fields. Degrees that fuse fields of study like the Ph.D. in Unmanned Systems Applications require experts with a high level of expertise. The technology environment/issues change so rapidly that we are well served in academics by those actively involved in the defense of our resources. In the academic environment, it is difficult to find in those willing to sacrifice the high wages that come with this expertise in the private and public sectors. The university is not willing to sacrifice the quality of the learning experience; therefore, we engage the experts as adjuncts or Professors of Practice (part-time faculty under annual contracts).

Examples of these experts:

Dr. Jami Carroll: Dr. Carroll has an MBA, government contract experience, and is a cybersecurity expert worldwide -- all of which allows him to provide a high-level learning experience.

Dr. Perry: Holds a high-level position in the applied area of cybersecurity and analytics.

Dr, Darraj: Dr. Darrraj works as a cybersecurity expert across multiple disciplines within the cyber field, including data. She also is employed as a dissertation chair in our D.Sc. in Cybersecurity and Ph.D. in Management and Decision Sciences.

Dr. Pomper: Dr. Pomper is an expert in cybersecurity and works as a certification expert in the field. She has years of business experience in the private and government environment that allows her to provide a high-level learning experience.

Dr. Johnson: Dr. Johnson is a recently retired Army major. She holds a CISSP certification in cybersecurity and held the position of CIO while in the Army. She currently holds a full-time position at a community college teaching cybersecurity. Dr. Johnson is currently employed by Capitol as an adjunct in cybersecurity and a dissertation chair for our Ph.D. in Management and Decision Sciences and our D.Sc. in Cybersecurity. Dr. Johnson has accepted a full-time position with Capitol teaching cybersecurity and analytics at the graduate and doctoral level beginning January 2018.

Fusing fields of study requires individuals with a skill set built on multiple fields of study and experience. The unique skill set of these individuals provide the type of high-level learning experience the university demands.

FACULTY WITH SPECIFIC EXPERTISE:

Dr. Beckett has a professional certification (i.e., PMP) in project management.

J. Adequacy of library resources (as outlined in COMAR 13B.02.03.12):

1. **Describe the library resources available and/or the measures to be taken to ensure resources are adequate to support the proposed program. If the program is to be implemented within institutional resources, include a supportive statement by the President for library resources to meet the program's needs.**

   Library Services: The Puente Library offers extensive services and a wide collection for Capitol students to be academically successful. Library resources are available digitally. The library also provides a mailing service for materials borrowed through the Maryland system. The library is currently supporting the following degrees at the graduate level: M.S. in Computer Science, M.S. in Cyber and Information Security, M.S. in Electrical Engineering, M.S. in Information Systems Management, M.S. in Internet Engineering, M.B.A., D.Sc. in Cybersecurity, and Ph.D. in Business Analytics and Decision Sciences. Therefore, the library is fully prepared to support a Ph.D. in Unmanned Systems Applications.

   Services provided to on line students include:

   - "Ask the Librarian"
   - Research Guides
   - Tutorials
   - Videos
   - Online borrowing

Capitol Technology University's online library as well as the on-campus library provides faculty and students with reference documents as well as texts appropriate to their learning experiences. Information about those services may be found at: http://library.captechu.edu/

Capitol Technology University is a member of the American Library Association (ALA).

The John G. and Beverley A. Puente Library provides access to management, decision science, and research methods materials through its 10,000-title book collection, e-books, and its 90 journal subscriptions. The library will continue to purchase new and additional materials in the management, decision science, and research methods area to maintain a strong and current collection in this subject area. Students can also access materials through the library's participation in the Maryland Digital Library Program (MDL). This online electronic service provides access to numerous databases (Access Science, NetLibrary) that will provide access to the materials needed. Available databases include ProQuest, EBSCO, ACM, Lexis Nexis, Taylor Francis, and Sage Publications.

The Puente Library can provide access to historical management and decision science materials through its membership in the Maryland Independent College and University Association (MICUA) and the American Society of Engineering Education (ASEE). Reciprocal loan agreements with fellow members of these organizations provide the library access to numerous research facilities that house and maintain archives of management and data science documents. The proximity of the University of Maryland, College Park and other local area research and academic libraries provides the Puente Library with quick access to these materials as well.

The library currently supports the needs students at the masters and doctoral level.

K. Adequacy of physical facilities, infrastructure and instructional equipment (as outlined in COMAR 13B.02.03.13):

1. **Provide an assurance that the physical facilities, infrastructure and instruction equipment are adequate to initiate the program, particularly as related to spaces for classrooms, staff and faculty offices, and laboratories for studies in the technologies and sciences. If the program is to be implemented within existing institutional resources, include a supportive statement by the President regarding adequate equipment and facilities to meet the program's needs.**

   No new facilities are required for the program. The university has sufficient classrooms to accommodate any hybrid or traditional classroom courses. The online class platform is web based and requires no additional equipment for the institution. The current learning management system meets the needs of the degree program. The Business and Technology Lab, Cyber Lab, and Unmanned Systems Lab all together meet the potential research needs of the students providing local and virtual support.

L. Adequacy of financial resources with documentation (as outlined in COMAR 13B.02.03.14):

1. **Complete Table 1: Resources. Finance data for the first five years of the program implementation are to be entered. Figures should be presented for five years and then totaled by category for each year.**

TABLE 1: RESOURCES

Resource Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. Reallocated Funds	$0	$0	$0	$0	$0
2. Tuition/Fee Revenue (c + g below)	$310,539	$591,996	$998,909	$2,110,353	$2,674,672
a. Number of F/T Students	9	17	28	59	73
b. Annual Tuition/Fee Rate	$25,619	$26,003	$26,393	$26,789	$27,191
c. Total F/T Revenue (a x b)	$230,571	$442,056	$739,013	$1,580,565	$1,984,948
d. Number of P/T Students	8	15	26	53	69
e. Credit Hour Rate	$833	$833	$833	$833	$833
f. Annual Credit Hour Rate	12	12	12	12	12
g. Total P/T Revenue (d x e x f)	$79,968	$149,940	$259,896	$529,788	$689,724
3. Grants, Contracts & Other External Sources	$0.00	$0.00	$0.00	$0.00	$0.00
4. Other Sources	$0	$0	$0	$0	$0
TOTAL (Add 1 – 4)	**$310,539**	**$591,996**	**$998,909**	**$2,110,353**	**$2,674,672**

This proposal builds upon existing degree programs.

2. **Provide a narrative rationale for each of the resource categories. If resources have been or will be reallocated to support the proposed program, briefly discuss those funds.**

   ### a. Reallocated Funds

   Capitol Technology University has reallocated funds during Year 1 for support of program and course development, online support, office materials, travel, professional development, and initial marketing. There is no substantial impact on the institution because of the reallocation of these funds. The reallocated funds will be recovered after the first year. The program is expected to be self-sustaining post Year 1.

   ### b. Tuition and Fee Revenue

   Tuition is calculated with no annual tuition increase. A 10% attrition rate has been calculated.

   ### c. Grants

   There are currently no grants etc. at this time.

   ### d. Other Sources of Funds

   There are currently no other sources of funds.

3. **Table 2: Expenditure. Finance data for the first five years of the program implementation are to be entered. Figures should be presented for five years and then totaled by category for each year.**

TABLE 2: EXPENDITURES
Courses are taught by adjunct professors.

Expenditure Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. Faculty (b + c below)	$66,924	$125,482	$209,136	$334,618	$418,273
a. # FTE	0.8	1.5	2.5	4.0	5.0
b. Total Salary	$55,309	$103,704	$172,840	$276,544	$345,680
c. Total Benefits	$11,615	$21,778	$36,296	$58,074	$72,593
2. Admin. Staff (b + c below)	$4,659	$4,798	$4,942	$5,090	$5,243
a. # FTE	0.07	0.07	0.07	0.07	0.07
b. Total Salary	$3,850	$3,966	$4,084	$4,207	$4,333
c. Total Benefits	$809	$833	$858	$883	$910
3. Support Staff (b + c below)	$57,475	$114,950	$172,425	$229,900	$287,375
a. # FTE	1.00	2.00	3.00	4.00	5.00
b. Total Salary	$47,500	$95,000	$142,500	$190,000	$237,500
c. Total Benefits	$9,975	$19,950	$29,925	$39,900	$49,875
4. Equipment	$1,000	$2,250	$5,085	$8,850	$10,250
5. Library	$5,000	$5,000	$5,000	$5,000	$5,000
6. New or Renovated Space	$0	$0	$0	$0	$0
7. Other Expenses	$20,000	$20,000	$20,000	$20,000	$20,000
TOTAL (Add 1 – 7)	**$155,057**	**$272,480**	**$416,589**	**$603,459**	**$746,141**

4. Provide a narrative rationale for each of the resource categories. If resources have been or will be reallocated to support the proposed program, briefly discuss those funds.

a. Faculty

Table 2 reflects the faculty hours in total, but this does not imply that these are new hire requirements.

b. Administrative Staff

Capitol Technology University will continue with current the administrative staff through the proposed period of time.

c. Support Staff

Capitol Technology University will continue with its current support staff. Additional support staff will be added in year 3.

d. Equipment

Software for courses is available free to students or is freeware. Additional licenses for the LMS will be purchased by the university at the rate of $50 per student per semester. No additional equipment is needed.

e. Library

Money has been allocated for additional materials to be added to the on campus and virtual libraries to ensure currency of literature. Additional subscriptions and access fees are required to expand the online database to support this degree.

6. New or Renovated Space

No new or renovated space is needed.

7. Other Expenses

Funds have been allocated for office materials, travel, professional development, course development, national and international marketing, and additional scholarships.

M. Adequacy of provisions for evaluation of program (as outlined in COMAR 13B.02.03.15):

The assessment process at the university consists of a series of events throughout the Academic Year. The results of each event are gathered by the University Assessment Team and stored in Canvas for analysis and use in annual reports, assessments, etc. The University Assessment Team analyzes the results, develops any necessary action plans, and monitors implementation of the action plans.

<u>Academic Year Assessment Events:</u>

Fall Semester:

- Faculty submit performance plans consistent with the mission and goals of the university and department. The document is reviewed and approved with the academic dean.
- Department Chairs and University Academic Dean review the Graduating Student Survey data.
- Department Chairs and University Academic Dean review student internship evaluations.
- Department Chairs and University Academic Dean review grade distribution reports from the spring and summer semesters.
- Department Chairs and University Academic Dean review student course evaluations from the summer semester.
- Departments conduct Industrial Advisory Board meetings to review academic curriculum recommendations. The Advisory Board meets to begin curriculum review or address special issues that may arise related to curriculum. Based on an analysis and evaluation of the results, the University Academic Dean, faculty and the advisory boards will develop the most effective strategy to move the changes forward.

   NOTE: A complete curriculum review for degrees in the Department of Engineering occurs every 2 years. In most cases, the changes only require that the University Academic Dean inform the CAO and provide a report that includes a justification and the impact of the changes as well as a strategic plan. Significant changes normally require the approval of the CAO and the Executive Council.

- University Academic Dean and Vice President for Academic Affairs attend the Student Town Hall and review student feedback with department chairs.
- Post-residency, the University Academic Dean meets with the faculty to review the student learning progress and discuss needed changes.
- At the August Faculty Retreat, the faculty reviews any outstanding student learning challenges that have not been addressed. The issues are brought to the University Academic Dean for review and development of implementation plans.

Spring Semester:

- Faculty Performance Plans are reviewed with faculty to identify issues of divergence and to adjust the plan as needed.
- Department Chairs and University Academic Dean review grade distribution reports from the fall semester.
- Department Chairs and University Academic Dean review the Graduating Student Survey data.
- Department Chairs and University Academic Dean review student course evaluations from the fall semester and the spring semester (in May before the summer semester begins).
- Department Chairs and University Academic Dean meet to review the content of the graduating student, alumni, and course surveys to ensure the surveys continue to meet the university's assessment needs.
- At Annual Faculty Summit in May, the faculty review and discuss student learning challenges from the past academic year and provide recommendations to the University Academic Dean for review and development of implementation plans.
- Department Chairs conduct interviews with potential employers at our Career Fair.
- Departments conduct Industrial Advisory Board meetings to review academic curriculum recommendations.

Based on the foregoing inputs from faculty, students, industry representatives and Department Chairs, the University Academic Dean prepares the proposed academic budget for the upcoming year. Budget increases are tied to intended student learning improvements and key strategic initiatives.

In addition to these summative assessments, the University Academic Dean meets with the Department Chairs weekly to review current student progress. This formative assessment allows for immediate minor changes, which increase faculty effectiveness and, ultimately, student outcomes.

The Faculty Senate meets monthly during August through April. The Faculty Senate addresses issues that impact student outcomes as those issues emerge. The leadership of the Faculty Senate then provides a report on the matter to the University Academic Dean. The report may include a recommendation or a request to move forward with a committee to further examine the issue. In most cases, the changes only require the University Academic Dean to inform the CAO and provide a report that includes a justification and the impact of changes as well as a strategic plan. Significant changes normally require the approval of the CAO and the Executive Council.

Student Learning Outcomes:

Student learning outcomes are measured using the instruments identified above as well as assigned rubrics/measures (e.g. capstone courses, competency exams/projects) dictated by the accreditation requirements of regional accreditor (Middle States Commission on Higher Education) and our degree specific accrediting body (i.e., ATMAE). This program is designed to meet the requirements of ATMAE and will be reviewed for accreditation by ATMAE.

N. Consistency with the State Minority Student Achievement goals (as outlined in COMAR 13B.02.03.05 and in the State Plan for Post-Secondary Education):

Capitol Technology University is a majority/minority school. Our programs attract a diverse set of students. Special attention is provided to recruit females into the STEM and multidisciplinary programs such as the B.S. MCIT, M.S. CIT, M.S. ISM, D.Sc., and Ph.D. in Business Analytics and Decision Sciences. The same attention will be given to the Ph.D. in Unmanned Systems Applications.

O. Relationship to low productivity programs identified by the Commission:

This program is not associated with a low productivity program identified by the commission.

P. If proposing a distance education program, please provide evidence of the Principles of Good Practice (as outlined in COMAR 13B.02.03.22C):

a. Curriculum and Instruction

Courses for this degree will be offered in an online classroom environment.

i. A distance education program shall be established and overseen by qualified faculty.

The Department of Doctoral Programs, where this degree will be sponsored, is staffed by qualified and appropriately credentialed faculty.

Evaluation of courses/programs are done using the same process as all other programs (see section M of this document). All Capitol faculty teach in the traditional classroom environment and online. (See qualifications in section I of this document)

ii. **A program's curriculum shall be coherent, cohesive, and comparable in academic rigor to programs offered in traditional instructional formats.**

Online programs/courses meet the same accreditation standards, goals, objectives, and outcomes as traditional instruction at the university. The online course development process incorporated the Quality Matters research-based set of standards for quality online course design to ensure academic rigor of the online course is comparable to the traditionally offered course. The dean, chairs, and faculty review curriculum annually. Courses are reviewed at the end of each term of course delivery. This process applies to online and traditional courses. In addition, advisory boards are engaged in the monitoring of course quality to ensure quality standards are met regardless of the delivery platform.

iii. **A program shall result in learning outcomes appropriate to the rigor and breadth of the program.**

Online programs/courses meet the same accreditation standards, goal, objectives, and outcomes as traditional classroom delivery. Learning platforms are chosen to ensure high standards of the technical elements of the course. The dean monitors any course conversion from in-class to online to ensure the online course is academically equivalent to traditionally offered course and that the technology is appropriate to support the expected rigor and breadth of the programs courses.

iv. **A program shall provide for appropriate real-time or delayed interaction between faculty and students.**

The program courses will be delivered in a format using Adobe Connect and the LMS Canvas. This system supports both synchronous and asynchronous interaction between faculty and students.

v. **Faculty members in appropriate disciplines in collaboration with other institutional personnel shall participate in the design of courses offered through a distance education program.**

Currently employed faculty acts as an internal advisory board for program changes including course and program development. All faculty are selected on domain experience and program-related teaching experience.

When new faculty or outside consults are necessary for the design of courses, our Human Resources Department initiates a rigorous search and screening process to identify appropriate faculty to design and teach online courses. All faculty are selected on domain experience and program-related teaching experience.

b. Role and Mission

i. A distance education program shall be consistent with the institution's mission.

Distance education is consistent with the institution's mission. Please refer to Section A of this proposal.

ii. Review and approval processes shall ensure the appropriateness of the technology being used to meet the program's objectives

The University Academic Dean and department chairs are an integral part of the curriculum approval process. The University Academic Dean, department chairs and faculty are participants in any new institutional technology changes. The University Academic Dean approves technologies brought into the classroom by faculty to ensure compatibility with existing technology as well as with course and institutional objectives.

c. Faculty Support

i. An institution shall provide for training for faculty who teach with the use of technology in a distance education format, including training and learning management system and pedagogy of distance education.

The Department of Distance Learning and the Information Technology Division support the online program needs of faculty and students. These departments and the help desk provide constant and ongoing support to the faculty. The Canvas portion of the program is the online Learning Management System. When a new faculty member is assigned to teach an online course, the Department of Distance Learning provides formal training for the instructor. New faculty are assigned an experienced faculty mentor to ensure a smooth transition to the online environment as well as to ensure compliance with the institution's online teaching pedagogy. The university believes this provides the highest-level learning experience for students and faculty.

ii. Principles of best practice for teaching in a distance education format shall be developed and maintained by the faculty.

The Department of Distance Learning, in conjunction with the University Academic Dean and an assigned mentor, provide ongoing support and instruction on best online practices. Best practices are shared among faculty by the dean and chair as well as through formal events. There are also several texts in the library available to the faculty, which cover distance learning techniques and technology.

iii. An institution shall provide faculty support services specifically related to teaching through a distance education format.

As mentioned previously, the university online platforms offer several avenues to support instructors engaged in online learning. The Director of the Department of Distance Learning is highly skilled and trained in faculty development. Several seminars and online tutorials are available to the faculty every year. Mentors are assigned to new faculty. Best practice sharing is facilitated through the dean and chair and through formal meetings.

d. An Institution shall ensure that appropriate learning resources are available to students including appropriate and adequate library services and resources.

Students can receive assistance in using online learning technology via several avenues. Student aides are available to meet with students and provide tutoring support in both subject matter and use of the technology. Tutors are available in live real-time sessions using Adobe Connect or other agreed upon tools. Pre-recorded online tutorials are also available.

In addition to faculty support, on ground and online tutoring services are available to students in a one-on-one environment.

Laboratories (on ground and virtual) are available for use by all students and are staffed by faculty and tutoring staff who provide academic support.

Library services and resources are appropriate and adequate. Please refer to Section J of this document and the attached letter from the university president, the library adequately supports the students learning needs.

e. **Students and Student Services**
    i. **A distance education program shall provide students with clear, complete and timely information on the curriculum, course, and degree requirements, nature of faculty/ student interaction, assumptions about technology competence and skills, technical equipment requirements, learning management system, availability of academic support services and financial aid resources, and costs and payment policies.**

        Students are provided support identical to traditional on campus students as the technology is utilized by all our students. Curriculum, course and degree information are available on the university website and via e-mail and mail by request. The expectations as it pertains to the faculty/student interaction are available to students during virtual open house events, literature, website, etc. In addition, this information is part of the material distributed for each course. Students receive guidance on proper behavior/interaction in the online environment to facilitate a high-level learning experience. Computer requirements are listed on our website and are provided to students in the welcome package. Students are provided a list of departmental services and contacts. Students may request special/additional training to include one-on-one training. In addition, training videos are available in Capitol Technology University's student web portal.

    ii. **Enrolled students shall have reasonable and adequate access to the range of student services to support their distance education activities.**

        Students have access to the same services as traditional on ground students. Some of these services are facilitated via such tools as Skype. For instance, distance students attend job fairs via Skype facilitated by an assigned campus representative. In addition, training videos are available in Capitol Technology University's student web portal.

    iii. **Accepted students shall have the background, knowledge and technical skills needed to undertake a distance education program.**

        Students are required to have the same skills as tradition on ground students. Training is available for students to familiarize them with the tools of the distance learning system.

iv. **Advertising, recruiting and admissions materials shall clearly and accurately represent the program and services available.**

Advertising, recruiting, and admissions materials do clearly and accurately represent the program and the services available.

f. **Commitment and Support**

i. **Policies for faculty evaluation shall include appropriate considerations of teaching and scholarly activities related to distance education programs.**

All faculty, including online faculty, are strongly encouraged to participate in at least one or two professional development opportunities to improve online teaching skills. Faculty are highly encouraged to share their experiences with fellow faculty as well as through publications and presentations. These factors are considered in the annual goals and objectives of faculty and, therefore, are considered in evaluation of performance for promotions, etc. Scholarly activities are recognized in formal university publications. Funding in the annual budget is provided for conferences in support of scholarly activities. Faculty meetings and colloquiums provide opportunities to share best practices among faculty. This includes online faculty. In addition, all faculty are offered the opportunity to attend the annual graduation ceremony and attend the annual faculty residency training event at the expense of the university.

ii. **An institution shall demonstrate a commitment to ongoing support, both financial and technical, and to continuation of a program for a period sufficient to enable students to complete a degree or certificate.**

The university has made the financial commitment to the program (please refer to Section L). The university has a proven track record of supporting degree completion.

g. **Evaluation and Assessment**
i. **An institution shall evaluate a distance education program's educational effectiveness, including assessment of student learning outcomes, student retention, student and faculty satisfaction and cost-effectiveness.**

The university applies the same evaluation standards and processes to all degree programs at the institution. (Please see Section M for an in-depth process description.)

In the Department of Doctoral Programs, where this program will be sponsored, evaluations are done at the course level, student level, curriculum level, and faculty level as well as other stakeholder groups.

Assessment is based on the integration of all the above items as appropriate. Changes are developed and implemented by the faculty responsible for the courses upon approval of the dean. At the end of this cycle, an evaluation is repeated and results analyzed with the appropriate stakeholders regarding the effectiveness of the changes. This is an ongoing process. The university has a vice president and team in charge of outcomes and assessment supporting formal assessment measures.

ii. An institution shall demonstrate an evidence-based approach to best online teaching practices.

Capitol Technology University has established a course/program matrix, which requires faculty to report student outcomes and suggestions for improving student performance. The university complies with the requirements of its accrediting bodies regarding outcomes/evidenced based accreditation (Middle States Commission on Higher Education, ABET, IACBE, and NSA/DHS). The university is in good standing with all its accrediting bodies.

iii. An institution shall provide for assessment and documentation of student achievement of learning outcomes in a distance education program.

The assessment for distance learning classes/students is the same as for all programs at the university. Faculty provide required data on student achievement. The Learning Management System provides data on student achievement. Proof of these assessments is available during the class and post class to the Vice President of Academic Affairs, University Academic Dean, and department chairs. On an annual basis, the information is reported to accreditation authorities such as Middle States Commission on Higher Education, IACBE, ABET, and NSA/DHS. The same requirement will occur with ATMAE for this program.