May 8, 2019

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 **Bachelor of Science (B.S.) in Facilities Management and Critical Infrastructure**. The degree curriculum will be taught using a significant number of existing faculty at our university and will be supplemented by new courses supporting the **B.S. in Facilities Management and Critical Infrastructure**. 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 **B.S. in Facilities Management and Critical Infrastructure** is consistent with this mission.

There is a growing requirement within the facilities management field for highly trained hybrid leaders who possess critical infrastructure knowledge, current technological skills, and traditional facilities management abilities. This program is in response to that need. The **B.S. in Facilities Management and Critical Infrastructure** degree is for both experienced facilities managers who desire to advance in their careers by earning a bachelor's degree as well as those desiring to enter the field.

To respond to the needs of the facilities management industry, we respectfully submit for approval a Bachelor of Science (B.S.) in Facilities Management and Critical Infrastructure. The required proposal is attached as well as 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.
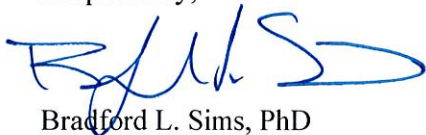
Respectfully,

Bradford L. Sims, PhD

May 8, 2019

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 **Bachelor of Science (B.S.) in Facilities Management and Critical Infrastructure**. As president of the university, I confirm that the library resources, including support staff, are more than adequate to support the **B.S. in Facilities Management and Critical Infrastructure**. In addition, the university is dedicated to, and has budgeted for, continuous improvement of its library resources.
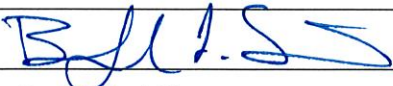
Respectfully,

Bradford L. Sims, PhD

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Cover Sheet for In-State Institutions
New Program or Substantial Modification to Existing Program

Institution Submitting Proposal	Capitol Technology University

Each action below requires a separate proposal and cover sheet.

- ⦿ New Academic Program New
- ◯ Area of Concentration New
- ◯ Degree Level Approval New
- ◯ Stand-Alone Certificate
- ◯ Off Campus Program

- ◯ Substantial Change to a Degree Program
- ◯ Substantial Change to an Area of Concentration
- ◯ Substantial Change to a Certificate Program
- ◯ Cooperative Degree Program
- ◯ Offer Program at Regional Higher Education Center

Department Proposing Program	Department of Business and Information Sciences
Degree Level and Degree Type	Bachelor of Science (B.S.)
Title of Proposed Program	B.S. in Facilities Management and Critical Infrastructure
Total Number of Credits	121
Suggested Codes	HEGIS: 908 CIP: 15
Program Modality	◯ On-campus ⦿ Distance Education (*fully online*) ◯ Both
Program Resources	⦿ Using Existing Resources ◯ Requiring New Resources
Projected Implementation Date	⦿ Fall ◯ Spring ◯ Summer Year: 2019
Provide Link to Most Recent Academic Catalog	URL: https://www.captechu.edu/current-students/academic-resources
Preferred Contact for this Proposal	Name: Professor Soren Ashmall
	Title: Director, Assessment & Accreditation
	Phone: (571) 332-4344
	Email: spashmall@captechu.edu
President/Chief Executive	Type Name: Dr. Bradford Sims
	Signature: *[signature]* Date: 5-8-19
Approval/Endorsement by Governing Board	Type Name: Dr. Bradford Sims
	Signature: *[signature]* Date: MAY 8, 2019

Revised 5/15/18

PROPOSAL FOR:

__X__NEW INSTRUCTIONAL PROGRAM

_____ SUBSTANTIAL EXPANSION/MAJOR MODIFICATION

_____ COOPERATIVE DEGREE PROGRAM

__X__WITHIN EXISTING RESOURCES or____REQUIRING NEW RESOURCES

CAPITOL
Technology University

Institution Submitting Proposal

Fall 2019
Projected Implementation Date

Bachelor of Science Award to be Offered	**Facilities Management and** **Critical Infrastructure** Title of Proposed Program
0908 Suggested HEGIS Code	**15.1501** Suggested CIP Code
Business and Information Sciences Department of Proposed Program	**Dr. Nayef Abu-Ageel** Name of Program Director

Prof. Soren Ashmall
Director, Assessment and
Accreditation

spashmall@captechu.edu
Contact E-Mail Address

571-332-4344
Contact Phone Number

_____ 5-8-19

Signature and Date

President/Chief Executive Approval

MAY 8, 2019

Date

Date Endorsed/Approved by Governing Board

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Proposed Bachelor of Science in Facilities Management and Critical Infrastructure
Department of Business and Information Sciences
Capitol Technology University
Laurel, Maryland

A. Centrality to Institutional Mission and Planning Priorities:

1. **Provide a description of the program, including each area of concentration (if applicable), and how it relates to the institution's approved mission.**

Bachelor of Science in Facilities Management and Critical Infrastructure Description:

The **Bachelor of Science (B.S.) in Facilities Management and Critical Infrastructure** curriculum is designed to meet the needs of industry and government. The **B.S. in Facilities Management and Critical Infrastructure** program combines education and experience in both technical and managerial skills to prepare students for leadership roles in the Facilities Management and Critical Infrastructure protection professions. Laboratory work supplements classroom lectures to provide practical and useful skills. Students gain additional real-world experience through participation in a required internship. With its comprehensive, management-oriented focus on facilities and critical infrastructure training, the program helps students understand the impact of facilities on improving the quality of life, productivity of the core business, environment, and society. The program prepares students to be leaders in this exciting field.

The **B.S. in Facilities Management and Critical Infrastructure** will also help prepare the student to earn the Facility Management Professional™ (FMP®), Certified Facility Manager® (CFM®), Sustainability Facility Professional® (SFP®), and RICS Chartered Qualification (MRICS) certifications.

The International Organization for Standardization (ISO) defines facilities management in ISO 41001:2018(en) as generally the organizational function that integrates people, place and process within a facility with the purpose of improving the quality of life of people and the productivity of the core business. Facility managers can have many different titles and arrive in their profession through a variety of career paths. Facility Managers are responsible for making sure systems of the facility work harmoniously. Facilities managers contribute to the organization's bottom line through their responsibility for maintaining what is often an organization's largest and most valuable assets, such as property, buildings, equipment and other environments that house personnel, productivity, inventory, and other important elements of operation.

Relationship to Institutional Approved Mission:

The **B.S. in Facilities Management and Critical Infrastructure** is consistent with the University mission to educate individuals for professional opportunities in engineering, computer science, information technology, and business. The University provides relevant learning experiences that lead to success in the evolving global community. Fundamental to the degrees in the Department of Business and Information Sciences are opportunities to pursue cutting-edge knowledge in management combined with technological applications, techniques, and

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procedures. The **B.S. in Facilities Management and Critical Infrastructure** is consistent with that philosophy. This same philosophy is supported by the University's existing degree programs and learning opportunities. The University has the following undergraduate degrees: B.S. in Astronautical Engineering, B.S. in Business Analytics and Data Science, B.S. in Computer Engineering, B.S. in Computer Engineering Technology, B.S. in Computer Science, B.S. in Construction Management and Critical Infrastructure, B.S. Construction Safety, B.S. in Cyber Analytics, B.S. in Cybersecurity, B.S. in Electrical Engineering, B.S. in Electrical Engineering Technology, B.S. in Engineering Technology, B.S in Management of Cyber and Information Technology, B.S. in Mechatronics Engineering, B.S. in Mechatronics and Robotics Engineering Technology, B.S. in Mobile Computing, B.S. in Software Engineering, and B.S. in Technology and Business Management, and B.S in Unmanned and Autonomous Systems. The University also has the following degrees at the graduate level: M.S. in Aviation, M.S. in Computer Science, M.S. in Critical Infrastructure, M.S. in Cyber Analytics, M.S. in Cybersecurity, M.S. in Engineering Technology, M.S. in Information Systems Management, M.S.in Internet Engineering, M.S. in Unmanned and Autonomous Systems Policy and Risk Management, M.B.A., T.M.B.A. Business Analytics and Data Science, T.M.B.A. in Cybersecurity, D.Sc. in Cybersecurity, Ph.D. in Aviation, Ph.D. in Business Analytics and Decision Sciences, Ph.D. in Construction Science, Ph.D. in Critical Infrastructure, Ph.D. in Manufacturing, Ph.D. in Occupational Health and Safety, Ph.D. in Technology, Ph.D. in Technology/M.S. in Research Methods Combination Program, and Ph.D. in Unmanned Systems Applications. The **B.S. in Facilities Management and Critical Infrastructure** degree fits within University's mission framework and is an integral part of the Strategic Plan for FY 2017-2021 and succeeding years. Funding to support the new degree has been included in the institutional and departmental budgets for FY 2019-2020 and forecasted budgets going forward.

The **B.S. in Facilities Management and Critical Infrastructure** degree will be offered with courses both "on ground" in a traditional classroom at the University campus and online using the Canvas Learning Management System and Zoom (which will replace Adobe Connect during Summer 2019). The result is the convenience required by the 21st Century learner and provides the interaction with faculty and fellow students that is critical to the high-level learning experience. The curriculum provides the undergraduate student the necessary learning tools that the University believes critical to success in the Facilities Management and Critical Infrastructure field. 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 four strategic goals:

1. **Expand Educational Offerings, Increase Program Completion:** *Capitol Technology University is an institution that offers career-relevant curricula with quality learning outcomes. The strategy includes continuing to expand educational offerings, increasing program completion, and raising learner qualifications and outcomes.*

2. **Increase Enrollment and Institutional Awareness:** *Capitol will accelerate its goal pursuit to become more globally renowned and locally active through student, faculty and staff activities. Enrollment will grow to 650 undergraduates, 350 masters' students and 250 doctoral candidates.*

3. **Improve the Utilization of University Resources and Institutional Effectiveness While Expanding Revenue**: *Capitol will likely continue to be 80% financially dependent on student tuition and fees. We plan to enhance our resources by expanding the range and amount of funding from other streams and aligning costs with strategic initiatives.*

4. **Increase the Number and Scope of Partnerships**: *Capitol's service to our constituents and sources of financial viability both depend upon participation with continuing and new partner corporations, agencies, and schools.*

The new **B.S. in Facilities Management and Critical Infrastructure** builds upon the existing areas of undergraduate degree programs: B.S. in Astronautical Engineering, B.S. in Business Analytics and Data Science, B.S. in Computer Engineering, B.S. in Computer Engineering Technology, B.S. in Computer Science, B.S. in Construction Management and Critical Infrastructure, B.S. in Construction Safety, B.S. in Cyber Analytics, B.S. in Cybersecurity, B.S. in Electrical Engineering, B.S. in Electrical Engineering Technology, B.S. in Engineering Technology, B.S in Management of Cyber and Information Technology, B.S. in Mechatronics Engineering, B.S. in Mechatronics and Robotics Engineering Technology, B.S. in Mobile Computing, B.S. in Software Engineering, and B.S. in Technology and Business Management, and B.S in Unmanned and Autonomous Systems. The University also provides the following opportunities at the graduate level for a student to continue his/her academic pursuits: M.S. in Aviation, M.S. in Computer Science, M.S. in Critical Infrastructure, M.S. in Cyber Analytics, M.S. in Cybersecurity, M.S. in Engineering Technology, M.S. in Information Systems Management, M.S.in Internet Engineering, M.S. in Unmanned and Autonomous Systems Policy and Risk Management, M.B.A., T.M.B.A. Business Analytics and Data Science, T.M.B.A. in Cybersecurity, D.Sc. in Cybersecurity, Ph.D. in Aviation, Ph.D. in Business Analytics and Decision Sciences, Ph.D. in Construction Science, Ph.D. in Critical Infrastructure, Ph.D. in Manufacturing, Ph.D. in Occupational Health and Safety, Ph.D. in Technology, Ph.D. in Technology/M.S. in Research Methods Combination Program, and Ph.D. in Unmanned Systems Applications. The University's undergraduate degree programs prepare students to begin their careers, or further their careers, fully employed with enhanced leadership skills and technical expertise that meet the needs information-dependent organizations using modern technology. 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 **B.S. in Facilities Management and Critical Infrastructure** will contribute to that legacy and will allow students to elevate their skills and careers to the next level within the evolving Facilities Management and Critical Infrastructure community.

The proposed **B.S. in Facilities Management and Critical Infrastructure** is fully supported by the University's Vision 2025 and Strategic Plan 2017-2025. Funding to support the degree has been included in forecasted budgets going forward.

If approved, the new **B.S. in Facilities Management and Critical Infrastructure** will use the Capitol Technology University's Information Literacy Path in the same manner as all of the other degrees at the institution. Information Literacy is infused in to the university's curriculum and the undergraduate experience. Capitol Technology University's Information Literacy Path begins during Orientation and Freshman Seminar. The experience continues every semester through the university's Writing Across the Curriculum program where there are writing assignments in all courses -- some of which require significant research. During the Freshman year, students are required to take English Communications I (EN-101) and English Communications II (EN-102).

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Both courses have a series of writing assignments that begin during Week 1 and continue to Week 16 of the semester. In addition to examining literature, EN-102 requires a team project in global research. There are two other courses that are required by every degree at the university: Ethics (SS-351) and Arts and Ideas (HU-331). Both courses are focused on research and experiential learning. All students also have access to information videos on the university's portal that support Information Literacy through the university library. All students at the University will experience all the markers in the Information Literacy Path regardless of learning modality (i.e., online, on ground, and hybrid).

The University also has active partnerships in the private and public arenas (e.g., Parsons Corporation, Leidos, Patton Electronics, Lockheed Martin, Northrup Grumman, Cyber Security Forum Initiative, IRS, NCS, NSA and DHS). The **B.S. in Facilities Management and Critical Infrastructure** degree will provide new opportunities for partnerships as well as expanded research. The increase in partnerships and placement of our graduates in our partner institutions will serve to expand the University's enrollment and reputation. While additional enrollment will increase financial resources, additional partnerships and grants in the Facilities Management and Critical Infrastructure field will help diversify and increase the University's financial resources.

3. **Provide a brief narrative of how the proposed program will be adequately funded for at least the first five years of program implementation. (Additional related information is required in section L.)**

   Capitol Technology University will support the proposed program through the same process and level of support as the University's existing programs. Many of the program's courses already exist within other programs in the university. The University has also budgeted funds to support program and course development, online support, office materials, travel, professional development, and initial marketing. There is no substantial impact to the institution due to the advanced budgeting of these funds. If approved, the program is expected to be self-sustaining going forward.

4. **Provide a description of the institution's a commitment to:**

   a. **Ongoing administrative, financial, and technical support of the proposed program**

      The proposed degree is an integral part of the University's Strategic Plan for FY 2017-2025 and forward. Funding for the administrative, financial, and technical support of the new degree has been included in the institutional and departmental budgets for FY 2019-2020 as well as the forecasted budgets going forward.

   b. **Continuation of the program for a period of time sufficient to allow enrolled students to complete the program.**

      Capitol Technology University is fully committed to continuing the proposed **B.S. in Facilities Management and Critical Infrastructure** degree program for a sufficient period to allow enrolled students to complete the program.

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.**

Technology is changing the required knowledge, skills and abilities in facilities management. New technological advances in almost every facet of the field now requires a modern set of individual capabilities. A team of industry experts and innovators, who run the AkitaBox website, are dedicated to observing trends in data-driven building management and across the facilities management field. In a recent article, AkitaBox reveals the five innovative technologies that are already transforming the field.

1. BIM for Facility Management
Building Information Modeling (BIM) is a tool used by contractors and architects to develop and scale virtual models of building projects. BIM gives building owners and operators a complete visual model of their facility prior to construction.

While BIM is not a new technology, it is just starting to become a commonplace in facility management. Facility operators are realizing the power of these tools for project deliver and data accessibility. When integrated with existing work order programs or facility maintenance software, facility teams realize an improved ability to retrieve O&M manuals, floor plans and asset information.

While still in its infancy, companies are recognizing the opportunity to improve collaboration and communication between building teams through this visual modeling.

2. The Internet of Things (IoT) in Facility Management
IoT refers to the network of internet accessible devices utilized by your facility. The IoT relies on tools such as sensors, thermostats and actuators to evaluate data and reduce the amount of energy used for tasks. Each sensor or device picks up data on a building to better inform a facility team of current temperature, light, vibration or even sound levels in areas of a building.

Think of the IoT much like you would view the human body. In a sense, the better the communication between the sum of different parts, the better the results will be for a healthier person with a cohesive functionality. Utilizing IoT systems correctly can reduce energy bills and provide insightful data to improve occupant happiness in your building.

A current challenge is that connectivity can be costly to set up. If you do not have a common hub to integrate devices into, it will be impossible to aggregate facility data into actionable metrics. This technology will continue to develop though, and undoubtedly will be a part of future smart buildings.

3. Advanced HVAC Technology
When it comes to large facilities, the HVAC system is a particularly expensive system to use and maintain. Technology and the implementation of "Green" ideas have promoted the change of HVAC systems for the better. To be able to reduce the cost of the heating

and cooling of your facility, while also reducing your environmental footprint is a benefit for all.

Advancements in HVAC facility management technologies and building automation systems (BAS) have come a long way in reducing facility management costs. These programs save facility managers money as they notify maintenance teams when systems are not operating effectively. This gives building operators the opportunity to prevent costly equipment failure by solving problems before they occur.

In the future, integration of these systems with facility maintenance software will also auto create and assign work orders to team members based on the asset type and location. The main struggles with implementing advanced HVAC technology and a new BAS is time and cost. Before going down the road of implementing a new BAS, take the time to explore what the return on investment will be for a new system.

4. Automated Facility Maintenance Software
Without facility maintenance software, facility managers are left to perusing spreadsheets, rolling out (and sometimes dusting off) paper blueprints, or simply relying on experience, wisdom and memory to run their facilities. Undocumented knowledge will lead to dilemmas, especially when one facility manager leaves and a new one comes in. This lack of facility management technology can have a detrimental impact on the building itself and lead to more expensive repairs. Existing paper-based work orders have the potential to cause duplicate data entry.

Automation is the key to success in future buildings. Rather than team members wasting time searching for information on the assets that need to be serviced in a facility, these systems will automatically surface needed information when a work order is created.

5. Drones in Facility Management
Drones bring incredible opportunities for improved efficiency in facility management. The biggest opportunity for these unmanned aerial vehicles (UAVs) is in safety and automation. For example, in the future roof inspections after a hail storm will be coordinated by groups of drones controlled by pre-programmed GPS routes. Eliminating the need to have team members climb on facility roofs with a clip board and camera to document damage.

(Source: https://home.akitabox.com/blog/the-5-biggest-innovations-in-facility-management-technology)

The revolution of technology in facilities management is occurring at the same time as the need to protect of all 16 sectors of the nation's Critical Infrastructure is growing and becoming even more pressing than in the past. As a result, the modern Facilities Manager must also possess up-to-date knowledge about Critical Infrastructure. Every managed facility fits within one of those 16 sectors.

Capitol Technology University believes it is imperative for the State of Maryland to take the lead in properly educating and training students at the interdisciplinary intersection of Facilities Management and Critical Infrastructure.

In 2013, Presidential Policy Directive 21 (PPD-21) called for a national unity of effort in this arena.

> The Nation's critical infrastructure provides the essential services that underpin American society. Proactive and coordinated efforts are necessary to strengthen and maintain secure, functioning, and resilient critical infrastructure – including assets, networks, and systems -- that are vital to public confidence and the Nation's safety, prosperity, and well-being.

> The Nation's critical infrastructure is diverse and complex. It includes distributed networks, varied organizational structures and operating models (including multinational ownership), interdependent functions and systems in both the physical space and cyberspace, and governance constructs that involve multi-level authorities, responsibilities, and regulations. Critical infrastructure owners and operators are uniquely positioned to manage risks to their individual operations and assets, and to determine effective strategies to make them more secure and resilient.

> Critical infrastructure must be secure and able to withstand and rapidly recover from all hazards. Achieving this will require integration with the national preparedness system across prevention, protection, mitigation, response, and recovery.

(Source: https://obamawhitehouse.archives.gov/the-press-office/2013/02/12/presidential-policy-directive-critical-infrastructure-security-and-resil)

The prevention, protection, mitigation, response, and recovery of Critical Infrastructure is highly dependent on the Facilities Management industry and its leaders. Facilities Management professionals must be educated in the body of knowledge gained since the 9/11 Terrorist Attacks and lessons learned so the Facilities Management field can take a proactive approach in a national unity of effort to protect our Critical Infrastructure.

A recent article entitled "Cyber Secured Building Management Systems" provides one aspect of the needs in facilities management and Critical Infrastructure.

> When dealing with Industrial Control Systems (ICS), most people consider the typical utility applications and the Critical Infrastructure Protection (CIP) as the main segments. However, the overall ICS activity is much broader and includes communication backbones, transportation, public safety sirens, manufacturing, etc., also considered as ICS, and often known as Operation Technology (OT) and Supervisory Control and Data Acquisition (SCADA). In this article, I'll specifically point out another segment called Building and Energy Management Systems (BEMS), which is also known as Building Automation System (BAS) or Building Management Systems (BMS).

> While for IT cybersecurity, we are always concerned about Confidentiality-Integrity-Availability (CIA); for ICS/SCADA/OT (including BEMS/BAS), we say Safety-Reliability-Productivity (SRP). These systems control a wide range of operations in buildings such as electricity supply, backup generators and uninterrupted power supplies (UPS), heat, ventilation, air-conditioning (HVAC), elevators, water and sewage, smoke and fire, CCTV surveillance, door locking, etc. This paper also refers to the specific risks and defenses for buildings where Data Centers (DC) reside.

Applicable risks for BEMS/BAS

Some of the applicable control solutions which you may find in buildings are supplied by the vendor of the system (fire extinguishing, generator control, elevator control, etc.), while other control solutions such as monitoring of electric power breakers, smoke detectors, door locking, CCTV, water and sewage, etc., are built with standard ICS or SCADA components and software. Prior to elaborating on the cyber security topic, it is important to mention that every ICS architecture must be designed with safety in mind:

1. The system must behave safely even if a sensor or the control device fails or a bug is activated.
2. The system must not enter an unstable mode if an authorized person makes a mistaken action.
3. Internally or externally generated cyber-attack must not affect the safe and stable operation.

When elaborating on BEMS/BAS, a cyber-attack may interfere with the normal life of people in the building. Some of these attacks may cause slight inconvenience, while others might lead to evacuating the building and even a panic action. Some applicable examples are listed in the table:

INCIDENT IN THE BUILDING CAUSED BY AN ATTACK	INCONVENIENCE	EVACUATION	PANIC / DAMAGE
Attacking the CCTV cameras to prevent detection			●
Shutting down the air-condition in data centers			●
False activation of sprinklers in offices and DC		●	●
False activation of water sensors on the DC floor			●
Attacking the hotel system managing door cards	●		●
False action locking the fire doors in corridors	●		●
Stopping operation of elevators in the building	●		●
Shutting down the lighting in offices and corridors	●		●
Shutting down the HVAC system in office rooms	●	●	
Activation of smoke-fire alarms in the building	●	●	●

Cyber-attack surface for BEMS/BAS

The majority of cyber-attacks on organizations start with a damaging social engineering activity, such as phishing and spear phishing. Other attacks are possible by an attacker entering the facility (as cleaning personnel, service provider, pizza or birthday gift delivery, etc.), who may insert a USB into a PC while working in your office. The following are a few scenarios of incidents, which may affect your BEMS/BAS operation:

- When dealing with BEMS/BAS related cyber security, the most critical risk is caused by poor guarding of the entrance to the facility. Cyber security experts say that if you cannot assure physical security, then it is not worth worrying about cyber risks, as the easiest way to attack a system is by accessing one the computers or devices connected to the Ethernet – intranet network.

- According to publications, the majority (60-90%) of "successful" cyber-attacks are possible due to negligent behavior of people (simple passwords, reuse of office password for social media, responding to suspicious mails, allowing remote accessing of your computer, etc.). Once the attacker connects to your IT network, he may easily compromise several security barriers and launch the attack.
- The majority of BEMS/BAS are maintained by outsourced service providers. They conduct periodic inspections, repair or replace what is needed, and are granted with "unlimited freedom". An unfortunate human error or a sabotage action by an authorized serviceman may cause the disabling of a safety device (i.e. overheat sensor), change the calibration, etc. They may intentionally replace a controller with a malverized unit, leave on-site a remote access modem (risky backdoor), or change critical programs by using his own laptop PC which might be infected prior to his arrival.
- BEMS/BAS often utilize controllers, some which are not configurable to perform a process, just to monitor a device or perform a simple ON/OFF command. These are either low cost Programmable Logic Controllers (PLC) or low cost Direct Digital Control (DDC) devices. When supplied, they are configured with a published username and password which is the standard "factory default".
- Today we frequently hear about Industrial Internet of Things (IIoT) devices (e.g., industrial sensors, CCTV camera, etc.) which are installed at remote, often unmanned locations and communicate via a wireless network with the control center or a PLC which supervises their operation. An attacker may initiate a Man-in-the-Middle (MitM) type attack and introduce fake indications to the control center.
- Deployment of IoT and IIoT devices which participate in an extended ecosystem is aimed at delivering valuable operating and cost benefits. However, adding these devices to the network also increases the cyber-attack surface and makes it easier for adversaries to compromise your BEMS/BAS.

Cyber defense solutions

According to the scenarios mentioned above, BEMS/BAS may include a dozen different, independently operating control systems. Some are a part of the supplied assembly, and some may be built by an integrator using Commercial Off the Shelf (COTS) components and software. In order to manage the building operation, the cyber security expert must deploy several defense measures, each tuned to guard a specific segment:

- Separation to zones between control networks: While technically possible to combine all control processes under a single ICS operation, this method is not desirable. Adversaries might approach the least secure site and penetrate through it, laterally expanding to all BEMS/BAS operations.
- Preventing data exchange among unrelated PLCs: Your experts must detect which PLCs absolutely must communicate each with other, and all other links shall be blocked. If needed, you may link these PLCs via DI/DO or analog signal AI/AO as an alternative to the Ethernet connection.
- Deployment of Intrusion Detection System (IDS): Use of IDS is a good method for detecting anomaly behavior on some sections of the BEMS/BAS. IDS can be directed to communication processes or control process anomalies and it may also effectively help detecting Zero-Day attacks.

- Sanitizing process performing CDR: These kiosks perform Content Disarm and Reconstruct (CDR) and lead to detection of malverized files in an imported media. This process can only be used for standard files (*.jpg, *.doc, *.gif, etc.) but not for files which contain application/control programs.
- Industrial firewall: Firewalls are not a new technology and are widely used for IT cyber defense. Deployment of a SCADA-Aware firewall in BEMS/BAS networks requires that the selected device and its software are capable of handling BEMS/BAS protocols like: BACnet, MODBUS, DNP 3.0, etc.
- Performing strong authentication: This topic refers to several segments: a) direct connection of an external PC to the HMI, b) connection to any control device (PLC), c) access via the internet by an authorized person. Very important to limit the time and allow as short as possible remote connection.
- Secure link between the HMI and PLCs: The encryption is mandatory for connection with remote devices where you face MitM risk and worry about data leak. However, the encryption will not protect your system when the attacker performs a "replay attack" (same message multiple times).
- Unidirectional Diode for data exporting: This mechanism is effective when you are concerned about injection of a malverized script into a BEMS/BAS network from the IT network. Important to note that this method will not protect you against internally generated attacks (A USB plugged into a computer).
- Physical security around control sites: This topic was already mentioned, but worth saying again, that physical security is an absolute precondition to cyber security. Therefore, protect your remote sites at every segment of the BEMS/BAS where an adversary may access your network.
- Hardening procedure: According to the information mentioned above, today we are using COTS hardware and software for building some parts of the BEMS/BAS architecture. Therefore, it is highly important that all unused services and connection ports (hardware and software) are disabled.
- Secured access to HMI and engineering stations: These computers are located in the control room and engineers' room. In order to simplify the operation, the access to the HMI may allow all users to log-in with the same credential. The Engineering station is highly critical and must be strongly protected.
- Cyber secured maintenance for all BEMS/BAS sections: This is a critical topic, as an external service person can freely work on site and any of his actions may lead to a harmful incident. Deployment of software changes and updates shall be rather delayed and done only after extensive testing.

Summary

BEMS/BAS system…operators must be aware of potential harm from cyber-attacks targeted to generate data leak, damage and panic in buildings, campuses and data-center operations. Therefore, managers in charge of new BEMS/BAS project and those maintaining an existing facility must receive the needed budgets and human resources for strong cyber defense.

C-level executives need to be well aware of the inconvenience which cyber-attacks may cause to their customers and financial damage to their own organization. Last but not least, they must worry about their own reputation and future in case of negligent handling of BEMS/BAS cyber security making the attack possible.

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

Capitol Technology University is a diverse multiethnic and multiracial institution with a long history of serving minority populations. The University has a 51% minority student population with 7% undisclosed. The Black/African American population is 34%. The university has military/veteran population of 22%. The University also has a 22% female population – a significant percentage given its status as a technology institution. If approved, the proposed **B.S. in Facilities Management and Critical Infrastructure** will expand the field of opportunities for minorities and disadvantaged students.

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

While Capitol Technology University is not a historically black institution, the University is a diverse multiethnic and multiracial institution with a long history of serving minority populations. The University has a 51% minority student population with 7% undisclosed. The Black/African American population is 34%. The University has military/veteran population of 22%. The University also has a 22% female population – a significant percentage given its status as a technology institution. If approved, the proposed **B.S. in Facilities Management and Critical Infrastructure** will expand the field of opportunities for minorities and disadvantaged students.

Data from the U.S. Bureau of Labor Statistics shows that African Americans and Hispanics represent just 9.9% and 15.9% of Professional and Business Services employment. The opportunities for graduates of color with this degree will increase their options for this line of rewarding employment.

Industry	2018				
	Percent of total employed				
	Women	White	Black or African American	Asian	Hispanic or Latino
Professional and Business Svcs.	41.5	78.1	9.9	9.0	15.9

(Source: https://www.bls.gov/cps/cpsaat18.htm)

Given the substantial minority population of Capitol Technology University, it is reasonable to assert that the **B.S. in Facilities Management and Critical Infrastructure** program will add to this base of minority participation in the Facilities Management and Critical Infrastructure industry.

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

The 2017-2021 Maryland State Plan for Postsecondary Education articulates three goals for postsecondary education:

1. Access
2. Success
3. Innovation

Goal 1: Access

"Ensure equitable access to affordable and quality postsecondary education for all Maryland residents."

Capitol Technology University is committed to ensuring equitable access to affordable postsecondary education for all Maryland residents. The University meets its commitment in this arena through its diverse campus environment, admissions policies, and academic rigor.

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's commitment to diversity is reflected in its student body. Capitol Technology University has a 51% minority student population with 7% undisclosed. The Black/African American population is 34%. The university has military/veteran population of 22%. The university also has a 22% female population – a significant percentage given its status as 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 and/or undergraduate 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 multiple diversity enhancing actions, including team projects and grants across degrees. This approach has proven effective at supporting multiple aspects of diversity.

Capitol Technology University does not discriminate on the basis of race, color, national origin, sex, age, sexual orientation, handicap in admissions, employment, programs, or activities.

Through its academic programs, Capitol Technology University seeks to prepare all its graduates to demonstrate four primary characteristics:

- **Employability:** *The ability to enter and advance in technical and managerial careers, appropriate to their level and area of study, immediately upon graduation.*
- **Communications:** *Mastery of traditional and technological techniques of communicating ideas effectively and persuasively.*
- **Preparation of the Mind:** *The broad intellectual grounding in technical and general subjects required to embrace future technical and managerial opportunities with success.*
- **Professionalism:** *Commitment to life-long learning, ethical practice and participation in professions and communities.*

The proposed **B.S. in Facilities Management and Critical Infrastructure** program and University financial aid will be available to all Maryland residents who qualify academically for admission.

The **B.S. in Facilities Management and Critical Infrastructure** program, with its academic rigor, will produce highly qualified Facilities Management and Critical Infrastructure professionals for this critical field of study and employment. The University has a proven record of rigorous high-quality education. The University is fully accredited by three accrediting organizations. In addition to regional accreditation from the Middle States Commission on Higher Education (MSCHE), the University also has specialized accreditation from the International Accreditation Council of Business Education (IACBE) and Accreditation Board for Engineering and Technology (ABET). The **B.S. in Facilities Management and Critical Infrastructure** program is consistent with the MSCHE criteria for regional accreditation of the delivery of high quality higher education.

Goal 2: Success

"Promote and implement practices and policies that will ensure student success."

The courses for the **B.S. in Facilities Management and Critical Infrastructure** will be offered both "on ground" in a traditional classroom at the University campus and online using the Canvas Learning Management System and Zoom (which will replace Adobe Connect during Summer 2019). This dual modality 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 throughout the admissions process regarding the cost to attend the University. The information is also publicly available on the University website. The University's Admissions Office and Office of Financial Aid identify potential grants, scholarships, and state plans for each student to reduce potential student debt. The net cost versus gross costs are identified clearly for the student. Students receive advising from Financial Aid Advisors prior to enrolling in classes for the first time. Admissions personnel, Student Services Counselors and Departmental Chairs advise students of the need for academic readiness as well as the degree requirements. A specific success pathway is developed for each student.

The University's tuition increases have not exceeded 3%. The University also has a tuition guarantee for undergraduates, which means full-time tuition is guaranteed not to increase more that 1% per year at the rate applied at time of enrollment. The tuition remains at this rate if the student remains enrolled full-time without a break in attendance.

The University has in place services and learning tools to guide students to successful degree completion. Programs such as Early Alert provide the University's faculty and staff opportunities for early student intervention on the pathway to graduation. This applies to all students regardless of the mode of course delivery or degree program. Capitol Technology University is also a transfer friendly institution and participates in multiple programs for government and military credit transfer. Capitol Technology University participates in the Articulation System for Maryland Colleges and Universities (ARTSYS) and has multiple transfer agreements with local institutions at all degree levels.

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

Goal 3: Innovation

"Foster innovation in all aspects of Maryland higher education to improve access and student success."

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 all classroom modalities as well as in a successful career after graduation. As a small institution, Capitol Technology University has the agility to rapidly integrate new technologies into the curriculum to better prepare students for the work environment. The University designs curriculum in alliance with its accreditation and regulating organizations and agencies.

The University also employs online virtual simulations in a game-like environment to teach the application of knowledge in a practical hands-on manner. The University is engaged with a partner creating high-level virtual reality environments for specific courses in the degree. This use of current technology occurs in parallel with traditional proven learning strategies. These elements of the University's online learning environment are purposeful and intended to improve the learning environment for both the student and faculty member. In addition, these elements are intentionally 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 their skills in interdisciplinary projects such as those in our Astronautical Engineering and Cyber Labs. In those labs, students become designers, builders, and project managers (e.g., to send a CubeSAT on a NASA rocket) and data analysts (e.g., to analyze rainforest data for NASA). The University's students recently launched another satellite aboard a NASA rocket from a location in Norway at the beginning of the 2019 Fall Semester. We are also recruiting additional partners for this proposed **B.S. in Facilities Management and Critical Infrastructure** for which real-world Facilities Management and Critical Infrastructure projects will provide students integrative learning opportunities.

The University also supports prior learning assessment. Portfolio analysis is available. The University accepts professional certifications for credit for specific courses. In addition, the University allows students to take a competency exam for credit for required courses up to the current state limits.

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

Describe potential industry or industries, employment opportunities, and expected level of entry (*ex: mid-level management*) for graduates of the proposed program.

Opportunities exist at all levels of government, private industry, and cross-sector organizations for professionals with the proposed **B.S. in Facilities Management and Critical Infrastructure**. There were 254,392 jobs listed recently on Indeed.com for facilities management, 3,696 jobs listed on indeed.com for building cybersecurity, and 15,684 jobs listed on indeed.com for facilities information assurance – a subset of Critical Infrastructure.

(Source: https://www.indeed.com/jobs?q=facilities+manager&l=)
(Source: https://www.indeed.com/jobs?q=building+cybersecurity&l=)
(Source: https://www.indeed.com/jobs?q=Facilities+Information+Assurance&from=sug)

The following chart illustrates the growth in knowledge needed by a facilities manager.
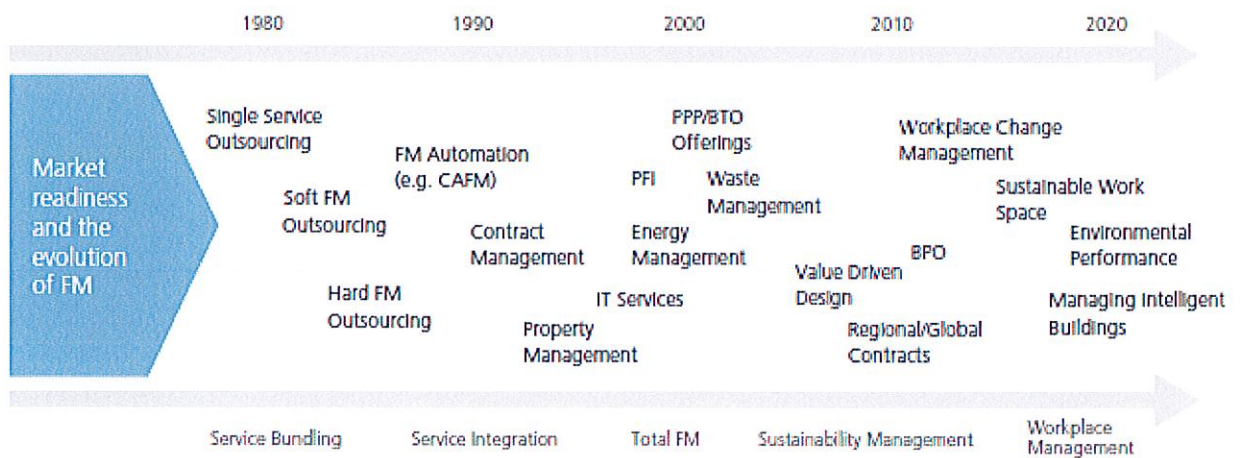
Source: Frost & Sullivan (Pitch to ISS, May 2013)

The chart above will continue to grow, and the required knowledge base for Facility Management will continue to increase, as the nation moves forward in protecting its Critical Infrastructure at all levels.

Graduates with the **B.S. in Facilities Management & Critical Infrastructure** degree will be expected to fill entry-level to mid-level management positions in existing government organizations and private companies. The job titles include:

- Facilities Manager
- Regional Manager of Facility Management
- Regional Manager of Property Management
- Director of Facility Management Operations
- Director of Property Management Operations
- Portfolio & Real Estate Professional
- Chief Engineer
- Senior Operations Manager
- Facilities/Property Supervisor
- Facilities Service Technician/Specialist
- Secret Service Special Officer – Facilities Specialization
- SCADA Engineer - Automation & Controls

Facilities Manager Career Paths (United States)

Facilities Manager

Facilities Director
Building & Facility Manager
Facility Manager
Regional Facilities Manager
Facilities / Maintenance Director

Facilities / Maintenance Director
Building & Facility Manager
Facility Manager
Facilities Director
Maintenance Director
Vice President (VP), Facilities Management
Building Manager
Regional Facilities Manager
Commercial Property Manager
Operations Director

Plan your career path. Drag job titles to investigate a particular path and click on a link to see where particular career can lead.

Explore more career paths »

PayScale

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

Interdisciplinary degrees that lead to hybrid jobs are growing much faster than single occupational field. In a recent article, "Hybrid Jobs Projected to Grow Twice as Fast as Jobs Overall," Burning Glass Technologies explains how the market is changing.

> "Hybrid jobs" represent a major shift in the makeup of occupations—and hybrid jobs growth is increasing twice as fast as the rest of the job market.
>
> Hybrid jobs are a challenge and an opportunity for educators and jobseekers alike, because they meld skills from different disciplines. For example, mobile application developers have to understand programming, design, data analysis, user experience and core marketing skills. Those who possess the right combination of these skills are highly sought – twice as much in demand as compared to skills requested in the overall job market.
>
> Burning Glass Technologies has developed a hybridization score for jobs, based on the extent to which they draw on skills from different fields. Our projections, based on our analysis of labor market demand via job postings, shows jobs with a "very high" hybridization score will grow nearly 16% by 2026, compared to 8.7% for jobs overall. Jobs with a low hybridization score, where skills are concentrated in one field, are only projected to grow 7.7%.
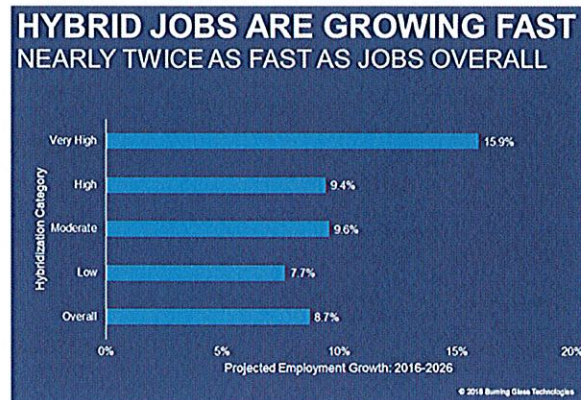
> In a 12-month period, we found that more than a quarter million job postings sought this kind of hybrid talent…
>
> The good news: Those with the needed skills can command salaries comparable to those for positions with more advanced technical requirements. The challenge: these skills aren't traditionally thought of as linked. Thus business, design and programming are skills and disciplines that aren't typically taught together – or sought out as a package by students.
>
> …The takeaway for educators: hybrid jobs growth will require students to mix skill sets, which means there's an opportunity for institutions that make it easier for students to combine courses and disciplines into these hybrid skill sets.

(Source: http://burning-glass.com/hybrid-jobs-growth/)

The protection of Critical Infrastructure, which includes facilities of almost every type, is one area that is now permeating all other sectors of the economy. One occupational field that also spans all areas of the economy is Facilities Management, making it an industry that will be required to address the protection of Critical Infrastructure.

"Security is no longer restricted to just technology companies or financial institutions… organizations in charge of critical infrastructure such as the electric grid grapple with skilled adversaries who take advantage of holes in the network defenses to cause damage."

(Source: http://burning-glass.com/average-cybersecurity-salary-over-93000/)

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.**

According to O*Net Online for positions of Administrative Services Managers (a grouping that includes Facility Managers), the projected growth 2016-2026 is faster than average at 10% to 14% and according to the Bureau of Labor Statics, the projected growth 2016-2026 is "faster than average."

' Wages & Employment Trends

Median wages (2017)	$45.20 hourly, $94,020 annual
State wages	Local Salary Info
Employment (2016)	282,000 employees
Projected growth (2016-2026)	▪▪▪ Faster than average (10% to 14%)
Projected job openings (2016-2026)	26,200
State trends	Employment Trends
Top industries (2016)	Educational Services Government

(Source: https://www.onetonline.org/link/summary/11-3011.00)

Quick Facts: Administrative Services Managers	
2017 Median Pay (?)	$94,020 per year $45.20 per hour
Typical Entry-Level Education (?)	Bachelor's degree
Work Experience in a Related Occupation (?)	Less than 5 years
On-the-job Training (?)	None
Number of Jobs, 2016 (?)	281,700
Job Outlook, 2016-26 (?)	10% (Faster than average)
Employment Change, 2016-26 (?)	28,500

(Source: https://www.bls.gov/ooh/management/administrative-services-managers.htm)

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

If approved, the **B.S. in Facility Management and Critical Infrastructure** will send its graduates in to the facilities industry with management skills, real-world experience through internships, and the ability to address one biggest threats to every industry: attacks on critical infrastructures. Students in the proposed degree will receive courses in Critical Infrastructure protection (as it relates directly to the construction of facilities in the 16 Critical Infrastructure protection sectors) as well as cybersecurity – an existing strength of the University and a key component of all Critical Infrastructure protection plans.

There are only a small number of bachelor's degrees in facilities management across the nation. The number of graduates from those programs is small. There are none in the State of Maryland. However, as outline in the previous sections, there are a large number of existing openings and job growth in the field is increasing at a very healthy annual rate. As a result, it is fair to assert that the current and projected supply of prospective graduates in the State of Maryland and the nation is significantly less than the number of job openings available.

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.**

There are no **B.S. in Facilities Management & Critical Infrastructure** degrees in Maryland or the surrounding region that the university could find. This situation presents an opportunity for the State of Maryland to have the first bachelors' degree of its kind in the state. It also presents the opportunity to offer a program that produces the future thought leaders and executive leaders from the facilities management field in Facilities Management and Critical Infrastructure. The program's professionals will be the most capable of planning the application of cutting-edge methods, tactics, techniques, and procedures to address the future needs of government, private industry, and existing organizations. Capitol Technology University's proposed **B.S. in Facilities Management & Critical Infrastructure** will be delivered online.

2. **Provide justification for the proposed program.**

    The **B.S. in Facilities Management & Critical Infrastructure** program is strongly aligned with the University's strategic priorities and is supported by adequate resources. The new **B.S. in Facilities Management and Critical Infrastructure** degree will strengthen and expand upon existing technology, management, and applied engineering degree programs at the University. The degree will present study in a rapidly changing and highly complex discipline. Research shows a significant shortage of Facilities Management and Critical Infrastructure professionals needed in this emerging discipline. This program helps fill the gap. 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. None of the Maryland HBIs offer a bachelor's degree in Facilities Management and Critical Infrastructure.

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. None of the Maryland HBIs offer a bachelor's degree in Facilities Management and Critical Infrastructure.

G. Adequacy of Curriculum Design, Program Modality, and Related Learning Outcomes (as outlined in COMAR 13B.02.03.10):

1. **Describe how the proposed program was established, and also describe the faculty who will oversee the program.**

    The proposed program was established through a rigorous review of unmet needs by the University's New Programs Group. The group includes selected representation from the faculty, administrators, and Executive Council. The program will be overseen by a diverse group of faculty members with backgrounds in facilities management, occupational health and safety, construction management, unmanned and autonomous systems, engineering, cybersecurity, mechanical engineering, environmental engineering, architectural engineering, strategic studies, computer science, building construction technology, and business. Please see Section I for a detailed list of the faculty's backgrounds.

2. **Describe educational objectives and learning outcomes appropriate to the rigor, breadth, and (modality) of the program.**

Educational Objectives:

a. Prepare students to critically analyze problems in a variety of disciplines and to identify relevant and useful information to 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 Facilities Management and Critical Infrastructure environment.
c. Prepare students to conceptualize, apply and integrate effective strategies and to use information effectively in the decision-making process.
d. Prepare students to apply knowledge in Facilities Management and Critical Infrastructure to emerging trends in Facilities Management.
e. Prepare students to conduct themselves professionally and ethically.
f. Prepare students to understand and analyze the Facilities Management and Critical Infrastructure.

Facilities Management Learning Outcomes & Related Student Competencies:

Upon graduation:

a. OUTCOME 1: Graduates understand the Facilities Management history, practice and profession.
   Competency 1 a: The student can explain the history, international practices, corporate organization and roles of the Facility Management profession. (ways of knowing)

b. OUTCOME 2: Graduates can plan and manage projects.
   Competency 2 a: The student can manage project initiation, planning, execution, control and closeout (ways of knowing), using scope, quality, schedule, budget, resources and risk (ways of understanding).

c. OUTCOME 3: Graduates can manage building systems, facility operations, occupant services and maintenance operations.
   Competency 3 a: Using principles of acquisition, installation, operations, maintenance, outsourcing, renovation and disposition of building systems, structure, interiors, exterior and grounds, the student can demonstrate the phases of facility management from design/acquisition to final disposition. (ways of understanding)
   Competency 3 b: As a foundation for operations, maintenance and energy management, the student can recognize the systems, services and functions thereof, and the software applications that support them. (ways of knowing)
   Competency 3 c: The student can assess the condition of the facility including its systems, structure, interiors, exteriors and grounds to establish a long-term facility plan for the organization. (ways of applying)
   Competency 3 d: The student can demonstrate a method to plan, measure and evaluate the facility's operational performance. (ways of applying)
   Competency 3 e: The student can interpret, apply, and recommend quality improvement programs. (ways of applying)
   Competency 3 f: The student aligns facility management technology with organizational information technology. (ways of understanding)
   Competency 3 g: The student can comprehend and prepare emergency preparedness and business continuity strategies. (ways of understanding)

Competency 3 h: The student can demonstrate awareness of sustainable stewardship principles applied to the built environment. (ways of applying)

d. OUTCOME 4: Graduates apply assessment, management and leadership principles of facility organizations and their stakeholders.
Competency 4 a: The student can identify the skills needed to strategically lead process, the organization, stakeholders and technologies in an ethically responsible way. (ways of knowing)

e. OUTCOME 5: Graduates apply fiscal management tools to the facility program and organization.
Competency 5 a: The student uses analysis, budgeting, accounting, risk management, and reporting to demonstrate applications of facility financial management. (ways of understanding)
Competency 5 b: The student can demonstrate applications of corporate real estate finance, management and transactional execution. (ways of applying)

f. OUTCOME 6: Graduates apply human factor principles to the facility operation and stakeholders.
Competency 6 a: Using factors around health, safety, welfare, comfort, safety and security within the organization, the student can practice applications of human resource management. (ways of applying)

g. OUTCOME 7: Graduates are effective communicators.
Competency 7 a: The student demonstrates written, oral, aural, and graphic communication skills through repetitive assessment and evaluation of industry appropriate genre. (ways of applying)

h. OUTCOME 8: Graduates apply Facilities Management Computer Applications.
Competency 8 a: The student demonstrates the ability to understand and to apply computer applications for facility management problem solving.

Critical Infrastructure Learning Outcomes:

Upon graduation:

a. Graduates will be prepared for employment in the field of Critical Infrastructure in a business sector of choice with a strong understanding of concepts, project management process and team management skills.

b. Graduates will understand the laws, regulations, and expectations as they relate to Critical Infrastructure.

c. Graduates will demonstrate familiarity with security operations and administration, and demonstrate a working knowledge of Critical Infrastructure and operational security.

d. Graduates will be able to demonstrate leadership qualities through experiential learning.

e. Graduates will understand the value of, and apply, sustainable building practices to optimize use of available resources.

1. Explain how the institution will:

a) Provide for assessment of student achievement of learning outcomes in the program

Capitol Technology University will assess student achievement of the learning outcomes per the regulations specified by two of the University's regional accreditation organizations, Middle States Commission on Higher Education (MSCHE), and specialized accreditation body for business, the International Accreditation Council for Business Education (IACBE). The University will also assess student achievement of the learning outcomes for Facilities Management per the regulations specified by the Facilities Management Accreditation Commission (FMAC).

Under MSCHE, the university will use Standard V, Educational Effectiveness Assessment, of the Standards for Accreditation and Requirements of Affiliation. Standard V requires:

> Assessment of student learning and achievement demonstrates that the institution's students have accomplished educational goals with their program of study, degree level, the institution's mission, and appropriate expectations for institutions of higher education.
>
> (Source: https://www.msche.org/?Nav1=About&Nav2=FAQ&Nav3=Question07)

Per the MSCHE's accreditation requirements, Capitol Technology University will measure Standard V by using the following criteria:

> An accredited institution possesses and demonstrates the following attributes or activities:
>
> 1. clearly stated educational goals at the institution and degree/program levels, which are interrelated with one another, with relevant educational experiences, and with the institution's mission;
>
> 2. organized and systematic assessments, conducted by faculty and/or appropriate professionals, evaluating the extent of student achievement of institutional and degree/program goals. Institutions should:
>
> a. define meaningful curricular goals with defensible standards for evaluating whether students are achieving those goals;
> b. articulate how they prepare students in a manner consistent with their mission for successful careers, meaningful lives, and, where appropriate, further education. They should collect and provide data on the extent to which they are meeting these goals;
> c. support and sustain assessment of student achievement and communicate the results of this assessment to stakeholders;

3. consideration and use of assessment results for the improvement of educational effectiveness. Consistent with the institution's mission, such uses include some combination of the following:

a. assisting students in improving their learning;
b. improving pedagogy and curriculum;
c. reviewing and revising academic programs and support services;
d. planning, conducting, and supporting a range of professional development activities;
e. planning and budgeting for the provision of academic programs and services;
f. informing appropriate constituents about the institution and its programs;
g. improving key indicators of student success, such as retention, graduation, transfer, and placement rates;
h. implementing other processes and procedures designed to improve educational programs and services;

4. if applicable, adequate and appropriate institutional review and approval of assessment services designed, delivered, or assessed by third-party providers; and

5. periodic assessment of the effectiveness of assessment processes utilized by the institution for the improvement of educational effectiveness.

(Source: https://www.msche.org/publications/RevisedStandardsFINAL.pdf)

Under IACBE, the university will also use IACBE's Assessment Pyramid to assess student achievement of the learning outcomes in the program:

The Assessment Pyramid below illustrates the general hierarchical relationships among mission, goals, outcomes, and objectives:

The Assessment Pyramid
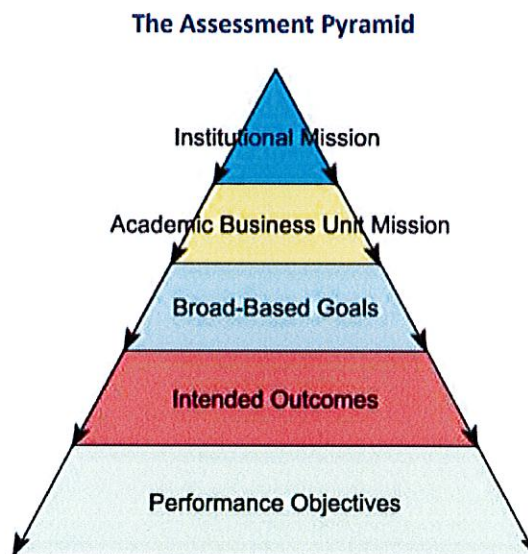
The Assessment Pyramid represents the flow from the institutional mission at the apex of the pyramid, which provides purpose and direction for the institution as a whole, followed by the mission of the academic business unit (and other academic units of the institution), and then down to the broad-based goals of the business unit, followed by

intended outcomes, and then finally down to performance objectives associated with the intended outcomes at the base of the pyramid.

The widening and downward flow from the institutional mission in this hierarchical structure indicates that:

- The mission of the academic business unit flows from the institutional mission and should be consistent with and contribute to the institutional mission.
- The broad-based goals flow from the mission of the academic business unit with multiple goals associated with the business unit's mission and each goal relating to some aspect of the mission.
- Intended outcomes flow from the broad-based goals with multiple intended outcomes associated with each goal.
- Performance objectives flow from the intended outcomes with multiple objectives associated with each intended outcome.
- Consequently, evidence of accomplishment of desired results at a given level in the pyramid hierarchy would then constitute evidence of accomplishment of the desired results in the level above it.

Institutional and Academic Business Unit Mission
The institutional mission statement is a concise statement that defines the general purpose of the institution as a whole, provides direction for all of its activities and operations, and guides decision making for all of its academic and non-academic functional units. Similarly, the academic business unit mission statement provides direction for and guides decision making of the academic business unit. Furthermore, the mission of the business unit should be consistent and consonant with the institutional mission in the sense that each element of the business unit's mission should be associated with and contribute to some aspect of the institutional mission.

Broad-Based Goals vs. Intended Outcomes
Goals and intended outcomes are similar in that they describe desired results of the various activities of the business unit and establish the foundation for assessment. The difference between the two lies in the degree of specificity and measurability.
Goals are broad, clear, and general statements of what the academic business unit intends to accomplish in terms of student learning and operational effectiveness. They describe the general aims and aspirations of the business unit and provide the general framework for determining the more specific intended outcomes for the unit. In addition, they should be consistent with the academic business unit's mission in the sense that each broad-based goal should be associated with, contribute to, and mapped to some aspect of the unit's mission.

The main function of the goals is to provide a link between the academic business unit's broadly-stated mission and the more specific intended outcomes for the unit (as described in the discussion of the pyramidal structure above). The broad-based goals then become a blueprint for implementing the business unit's mission and for developing measurable intended outcomes relating to student learning and operational effectiveness. Goals are generally too broadly stated in order to be measurable in and of themselves. Therefore, intended outcomes need to be articulated in order to make the goals specific and to describe what the goals actually mean, i.e., in order to be able to determine the extent to

which the goals have been met.

Intended outcomes are clear statements that describe in precise and measurable terms the specific, observable, and desired results pertaining to student learning and the operational effectiveness of the academic business unit. They flow from the academic business unit's broad-based goals and represent what students must specifically learn and what the academic business unit must achieve operationally in order to accomplish these goals. Consequently, each broad-based goal will usually have multiple intended outcomes associated with it. In addition, a particular intended outcome can support or contribute to the accomplishment of more than one goal.

Intended Outcomes vs. Performance Objectives

Once intended outcomes have been developed, the academic business unit must specify the ways in which it will measure the extent to which students and the business unit are achieving the intended outcomes. In other words, the specific instruments, tools, and metrics that will be used to assess the intended outcomes must be determined.

Whereas intended outcomes are expressed in terms of the specific knowledge, skills, and abilities that students are expected to acquire and in terms of the desired operational results of the academic business unit, performance objectives on the other hand are the desired quantitative performance results (or performance targets) on the assessment instruments, tools, and metrics that are used to measure the intended outcomes.

So, for example, if an academic business unit has defined an intended student learning outcome relating to the global dimensions of business and is measuring this outcome with a locally-developed examination (the assessment instrument), then a performance objective on this instrument for this outcome might be that 80% or more of the students will achieve a sub-score of at least 70% on the set of examination questions dealing with the international and global dimensions of business. Therefore, performance objectives are even more specific than intended outcomes in as much as they identify concrete quantitative targets for the assessment methods used to measure the achievement of the outcomes. Furthermore, each intended outcome should be capable of being measured by more than one assessment method, and would therefore have multiple performance objectives associated with it.

Summing Up

...As we move downward along the Assessment Pyramid, we progress from the broad and general to the narrow and specific. Intended outcomes and performance objectives provide the necessary degree of specificity and measurability required in order to determine the extent of student learning, operational effectiveness, and mission accomplishment.

(Source: http://iacbe.org/wp-content/uploads/2017/08/Outcomes-Assessment-Plan-Guidelines.pdf)

The following pages provide an example of how the IACBE Assessment Pyramid is implemented by the Capitol Technology University (using two of the University's bachelor's degrees):

OUTCOMES ASSESSMENT PLAN
Capitol Technology University
Department of Business and Information Sciences

Section I: Mission and Broad-Based Goals

MISSION STATEMENT

Mission of the Department of Business and Information Sciences:
Mission Statement: The mission of the School of Business and Information Sciences is to provide students a practical education in an environment supportive of academic excellence and high student achievement, preparing them to thrive in professional careers.

BROAD-BASED GOALS

Broad-Based Student Learning Goals:
1. **Employability:** Graduates will have an understanding of the difference between theory and practice and how to extract from theory and extend its application to real-world situations.
2. **Communications:** Graduates will be able to effectively communicate their ideas in both written and oral form (technical and non-technical) understanding that communication is a cooperative process in both the one-on-one and team environment.
3. **Preparation of the Mind:** Graduates will have a broad intellectual grounding in business and/or technology. Graduates will be able to analyze situations and successfully determine cause and effect. Graduates will know how to use contemporary research tools as well as more traditional methods to locate and analyze information and develop knowledge.
4. **Professionalism:** Graduates will have an understanding of their professional and ethical responsibilities. Graduates will have an understanding of the possible social, economic, cultural and environmental impact of their business and/or technical solutions in a global and social context. Graduates will recognize that lifelong learning is essential to the ongoing process of professional and personal development.

BROAD-BASED OPERATIONAL GOALS

Broad-Based Operational Goals:
1. The School of Business and Information Sciences will be successful in retaining its students based on the University's historical data. (see pg. 13)

2.	The School of Business and Information Sciences will recruit, retain and develop qualified faculty committed to academic excellence.
3.	The School of Business and Information Sciences will provide students a practical hands-on education.
4.	The School of Business and Information Sciences will offer strong, comprehensive, and contemporary degree programs that successfully prepare students for academic and professional careers, graduate school and professional advancement.
5.	The School of Business and Information Sciences will provide a supportive learning environment that fosters student success and contributes to excellence in business education.

Section II: Student Learning Assessment

STUDENT LEARNING ASSESSMENT: BACHELOR'S-LEVEL PROGRAMS

Student Learning Assessment for the Bachelor of Science in Business Administration (BSBA)

Program Intended Student Learning Outcomes (Program ISLOs)

1. Graduates will be able to explain the major concepts in the functional areas of core business courses.

   Broad-Based Student Learning Goals Associated with this Outcome: 1, 3

   Key Learning Outcomes for Bachelor's-Level Business Programs to which this Outcome is Linked: 1, 3

2. Graduates will be able to explain and evaluate possible economic, social, legal, ethical, and environmental impacts of their business solutions in a global environment in a management role.

   Broad-Based Student Learning Goals Associated with this Outcome: 4

   Key Learning Outcomes for Bachelor's-Level Business Programs to which this Outcome is Linked: 2, 4

3. Graduates will be able to describe the global business environment.

   Broad-Based Student Learning Goals Associated with this Outcome: 3, 4

   Key Learning Outcomes for Bachelor's-Level Business Programs to which this Outcome is Linked: 3, 4

4. Graduates will be able to employ decision-support tools to business decision-making.

   Broad-Based Student Learning Goals Associated with this Outcome: 1, 3

   Key Learning Outcomes for Bachelor's-Level Business Programs to which this Outcome is Linked: 5

5. **Graduates will be able to demonstrate** a mastery of traditional and technological techniques of communicating ideas effectively and persuasively.

   Broad-Based Student Learning Goals Associated with this Outcome: 2

Key Learning Outcomes for Bachelor's-Level Business Programs to which this Outcome is Linked: 6

6. Graduates will be able demonstrate knowledge as it relates to the BSBA core courses in an integrated manner within a global business environment.

Broad-Based Student Learning Goals Associated with this Outcome: 3, 4

Key Learning Outcomes for Bachelor's-Level Business Programs to which this Outcome is Linked: 1, 3

7. Graduates will be able to collaborate effectively with a team of colleagues on diverse projects.

Broad-Based Student Learning Goals Associated with this Outcome: 2, 4

Key Learning Outcomes for Bachelor's-Level Business Programs to which this Outcome is Linked: 3, 7

Assessment Instruments for Intended Student Learning Outcomes— Direct Measures of Student Learning:	**Performance Objectives (Targets/Criteria) for Direct Measures:**
1. Capstone Strategic Management (BUS 410) Case Study Program ISLOs Assessed by this Measure: 1, 2, 3, 4, 5, 6, 7	At least 75% of the students will score 70% or higher on the case study evaluation rubric. Rubric: See Appendix A, C, D
2. Capstone Senior Project (BUS 458) Program ISLOs Assessed by this Measure: 1, 2, 4, 5, 6	At least 75% of graduating seniors will score 80% or higher on the Capstone Senior Project evaluation rubric. Rubric: See Appendix B, C, D
Assessment Instruments for Intended Student Learning Outcomes— Indirect Measures of Student Learning:	**Performance Objectives (Targets/Criteria) for Indirect Measures:**
1. Graduating Student Survey (Undergraduate) Program ISLOs Assessed by this Measure: 1, 2, 3 4, 5, 6, 7	On the exit survey instrument, at least 80% of graduating seniors in business will indicate that they were "successful" or "very successful" in achieving the intended learning outcomes.

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	Instrument: See Appendix E
2. End-of-course survey (contains overall course and curriculum questions) Program ISLOs Assessed by this Measure: 1, 2, 3, 4, 5, 6, 7	At least 70% of the students "agree" or "strongly agree" that the overall quality of the course has met their expectations of quality and intended learning outcomes of the course. Instrument: See Appendix F

Student Learning Assessment for Bachelor of Science in Management of Cyber and Information Technology (BS MCIT)
Program Intended Student Learning Outcomes (Program ISLOs)

1. Graduates will be able to explain the major concepts in the functional areas of the degree program.

   Broad-Based Student Learning Goals Associated with this Outcome: 1, 3

   Key Learning Outcomes for Bachelor's-Level Business Programs to which this Outcome is Linked: 1

2. Graduates will be able to demonstrate a working knowledge of cybersecurity.

   Broad-Based Student Learning Goals Associated with this Outcome: 1, 3

   Key Learning Outcomes for Bachelor's-Level Business Programs to which this Outcome is Linked: 1

3. Graduates will be able to explain and evaluate possible economic, social, legal, ethical, and environmental impacts of their business solutions in a global environment in a management role.

   Broad-Based Student Learning Goals Associated with this Outcome: 4

   Key Learning Outcomes for Bachelor's-Level Business Programs to which this Outcome is Linked: 2

4. Graduates will be able to describe the global business environment.

   Broad-Based Student Learning Goals Associated with this Outcome: 3, 4

   Key Learning Outcomes for Bachelor's-Level Business Programs to which this Outcome is Linked: 3, 4

5. Graduates will be able to employ decision-support tools to business decision making.

   Broad-Based Student Learning Goals Associated with this Outcome: 1, 3

   Key Learning Outcomes for Bachelor's-Level Business Programs to which this Outcome is Linked: 5

6. Graduates will be able to demonstrate a mastery of traditional and technological techniques of communicating ideas effectively and persuasively.

Broad-Based Student Learning Goals Associated with this Outcome: 2

Key Learning Outcomes for Bachelor's-Level Business Programs to which this Outcome is Linked: 6

7. Graduates will be able to demonstrate in depth knowledge as it relates to the core business courses in an integrated manner within a global environment.

Broad-Based Student Learning Goals Associated with this Outcome: 3, 4

Key Learning Outcomes for Bachelor's-Level Business Programs to which this Outcome is Linked: 3

8. Graduates will be able to collaborate with a team of colleagues on diverse projects.

Broad-Based Student Learning Goals Associated with this Outcome: 2, 4

Key Learning Outcomes for Bachelor's-Level Business Programs to which this Outcome is Linked: 3, 7

Assessment Instruments for Intended Student Learning Outcomes— Direct Measures of Student Learning:	Performance Objectives (Targets/Criteria) for Direct Measures:
1. Capstone Strategic Management (BUS 410) Case Study Program ISLOs Assessed by this Measure: 1, 2, 3, 4, 5, 6, 7, 8	At least 75% of the students will score 70% or higher on the case study evaluation rubric. Rubric: See Appendix A, C, D

2. Capstone Senior Project (BUS 458) Program ISLOs Assessed by this Measure: 1, 2, 4, 5, 6	At least 75% of graduating seniors will score 80% or higher on the Capstone Senior Project evaluation rubric. Rubric: See Appendix B, C, D
Assessment Instruments for Intended Student Learning Outcomes— **Indirect Measures of Student Learning:**	**Performance Objectives (Targets/Criteria) for Indirect Measures:**
1. Graduating Student Survey (Undergraduate) Program ISLOs Assessed by this Measure: 1, 2, 3 4, 5, 6, 7	On the exit survey instrument, at least 75% of graduating seniors in management will indicate that they were "successful" or "very successful" in achieving the intended learning outcomes . Instrument: See Appendix E
2. End-of-course survey (contains overall course and curriculum questions) Program ISLOs Assessed by this Measure: 1, 2, 3, 4, 5, 6, 7	At least 70% of the students "agree" or "strongly agree" that the overall quality of the course has met their expectations of quality and intended learning outcomes of the course. Instrument: See Appendix F

Section III: Operational Assessment

INTENDED OPERATIONAL OUTCOMES: SCHOOL OF BUSINESS AND INFORMATION SCIENCES

Intended Operational Outcomes for the School of Business and Information Sciences:
1. The School of Business and Information Sciences will be successful in placing its undergraduates in appropriate entry-level positions or in graduate school on an annual basis. Broad-Based Operational Goals Associated with this Outcome: *4*
2. Faculty members in the School of Business and Information Sciences will engage in appropriate professional development activities on an annual basis. Broad-Based Operational Goals Associated with this Outcome: *2*
3. The School of Business and Information Sciences will be successful in providing high-quality instruction to its students. Broad-Based Operational Goals Associated with this Outcome: *4*
4. The School of Business and Information Sciences will be successful in providing high-quality advising to its students. Broad-Based Operational Goals Associated with this Outcome: *5*
5. Students in the School of Business and Information Sciences will participate in relevant internships on an annual basis. Broad-Based Operational Goals Associated with this Outcome: *3, 4*
6. The School of Business and Information Sciences will provide a practical hands-on experience. Broad-Based Operational Goals Associated with this Outcome: *3*
7. The School of Business and Information Sciences will be successful in retaining its students on an annual basis. Broad-Based Operational Goals Associated with this Outcome: *1*
8. The School of Business and Information Sciences will be successful in contributing to the professional advancement of its MBA and MSISM graduates. Broad-Based Operational Goals Associated with this Outcome: *4*

Assessment Measures/Methods for Intended Operational Outcomes:	Performance Objectives (Targets/Criteria) for Operational Assessment Measures/Methods:

1. *Report of the Office of Career Services and Graduate Student Support* Intended Operational Outcomes Assessed by this Measure: 1, 8	*The School of Business and Information Sciences will place 75% or more of its undergraduate students in degree related positions or in graduate school within nine months of graduation.*
2. *Graduating Student Survey* Intended Operational Outcomes Assessed by this Measure: 3	*At least 75 % of graduating students agreed or strongly agreed that the University provided high quality instruction.*
3. *Performance Review* Intended Operational Outcomes Assessed by this Measure: 2	*At least 75% of full-time faculty will participate in professional development activities (webinars, publication, conferences, workshops) on an annual basis.* *At least 50% part-time faculty will participate in professional development activities (webinars, publication, conferences, workshops) on an annual basis.*
4. *Continuation Rates Report* Intended Operational Outcomes Assessed by this Measure: 7	*At least 50% will graduate.*
5. *Course Survey—to include only those questions related to student satisfaction with course instruction and academic advising* Intended Operational Outcomes Assessed by this Measure: 3, 4, 6	*At least 75% of students will agree or strongly agree that they were provided high quality instruction in the course.* *At least 75% of students will agree or strongly agree that they were provided high quality advising.* *At least 75% will agree or strongly agree that they were provided hands on experiences.*
6. *Internship Report* Intended Operational Outcomes Assessed by this Measure: 5	*At least 40% of the students will participate in internships.*

b) Document student achievement of learning outcomes in the program

The University will document student achievement of the learning outcomes in the program in the same fashion as its current programs. The University will also publicly post the results of the assessment on its website per IACBE accreditation requirements.

The following pages are an example of the University's public disclosure of its assessment of the learning outcomes (for two of the University's bachelor's degree accredited by IACBE):

Report of Student Learning and Achievement

Capitol Technology University
Department of Business and Information Sciences

Mission of the Department of Business and Information Sciences
The mission of the Department of Business and Information Sciences is to provide students a practical education in an environment supportive of academic excellence and high student achievement, preparing them to thrive in professional careers.

Student Learning Assessment for the Bachelor of Science in Business Administration (BSBA)	
Program Intended Student Learning Outcomes (Program ISLOs)	
1.	Graduates will be able to explain the major concepts in the functional areas of core business courses.
2.	Graduates will be able to explain and evaluate possible economic, social, legal, ethical, and environmental impacts of their business solutions in a global environment in a management role.
3.	Graduates will be able to describe the global business environment.
4.	Graduates will be able to employ decision-support tools to business decision-making.
5.	Graduates will be able to demonstrate a mastery of traditional and technological techniques of communicating ideas effectively and persuasively.
6.	Graduates will be able demonstrate knowledge as it relates to the BSBA core courses in an integrated manner within a global business environment.
Assessment Instruments for Intended Student Learning Outcomes—	**Performance Objectives (Targets/Criteria) for Direct Measures:**

Direct Measures of Student Learning:

1. Capstone Strategic Management (BUS 410) Case Study	At least 75% of the students will score 70% or higher on the case study evaluation rubric.
Program ISLOs Assessed by this Measure: **1, 2, 3, 4, 5, 6**	
2. Capstone Senior Project (BUS 458)	At least 75% of graduating seniors will score 80% or higher on the Capstone Senior Project evaluation rubric.
Program ISLOs Assessed by this Measure: **1, 2, 4, 5, 6**	

Assessment Instruments for Intended Student Learning Outcomes— Indirect Measures of Student Learning:

	Performance Objectives (Targets/Criteria) for Indirect Measures:
1. Graduating Student Survey (Undergraduate)	On the exit survey instrument, at least 80% of graduating seniors in business will indicate that they were "successful" or "very successful" in achieving the intended learning outcomes.
Program ISLOs Assessed by this Measure: **1, 2, 3 4, 5, 6**	
2. End-of-course Survey (contains overall course and curriculum questions)	At least 70% of the students "agree" or "strongly agree" that the overall quality of the course has met their expectations of quality and intended learning outcomes of the course.
Program ISLOs Assessed by this Measure: **1, 2, 3, 4, 5, 6**	

Assessment Results: Bachelor of Science in Business Administration (BSBA)

Summary of Results from Implementing Direct Measures of Student Learning:

1. Capstone Strategic Management (BUS 410) Case Study:

Percentage of Students Achieving a Score of 70% or Higher on the Capstone Strategic Management Case Study:

Capstone Strategic Management Case Study (Program ISLO 1, 2, 3, 4, 5, 6):   100% of Total   (Class average score: 93.3%)

2. **Capstone Senior Project (BUS 458):**

Percentage of Students Achieving a Score of 80% or Higher on the Capstone Senior Project:

Capstone Senior Project (Program ISLO 1, 2, 3, 4, 5, 6):   100% of Total   (Class average score: 99%)

Summary of Results from Implementing Indirect Measures of Student Learning:

1. **Graduating Student Survey (Undergraduate):**

1. ISLO #1
    Understanding of issues related to my profession   85.7%
    Ability to identify, formulate and solve business problems   85.7%

2. ISLO #2
    Ability to make timely and informed decisions   85.7%
    Ability to apply appropriate business knowledge in an integrated manner within a global   85.7%
    environment

3. ISLO #3
    Understanding of issues related to my profession   85.7%
    Ability to apply appropriate business knowledge in an integrated manner within a global   85.7%
    environment

4. ISLO #4
    Ability to use appropriate business tools to solve problems   100%
    Ability to use current technological tools relating to the business environment   71.4%

	Ability to analyze and interpret data	71.4%
	Ability to apply management skills to business problem	100%
5.	**ISLO #5**	
	Ability to apply project management principles	85.7%
	Ability to present information effectively using current technology	100%
	Ability to prepare formal business communications (letters, memos, reports)	71.4%
6.	**ISLO #6**	
	Ability to design and use research tools (questionnaires, surveys, interviews)	85.7%
	Ability to apply appropriate business knowledge in an integrated manner within a global environment	85.7%
	Ability to design a system or process to meet desired needs	85.7%

2. **End-of-course Survey:**
(contains overall course questions, curriculum questions, and percentage of students who "agree" and "strongly agree")

No.	Statement	%
1.	The instructor was well prepared to present and discuss course material.	88.4%
2.	The instructor presented content in a systematic and organized fashion, relating parts to the whole.	89.3%
3.	The instructor used supplemental technology to present material (ex., audio visual aids, Canvas, www, etc.)	93.9%
4.	The instructor posed questions to students designed to promote critical thinking and analysis.	94.5%
5.	The instructor promoted free-flow of communication: instructor and student, and between students.	90.7%
6.	The instructor introduced divergent viewpoints in areas where different points of view exist.	88.5%
7.	The instructor clarified abstract and complex ideas, using examples within students	89%
8.	The instructor periodically evaluated students.	89.2%
9.	The instructor assigned homework which reinforces the lecture materials.	87.5%
10.	The instructor provided useful feedback on submitted materials.	86.2%
11.	The instructor was available outside of scheduled class hours.	81.4%

12. Course objectives were clearly defined. 89.4%
13. Dates for the submission of major materials were specified. 87.9%
14. Guidelines and requirements for presentations and written assignments were clearly stated. 88.4%
15. Clear, well-developed policies and procedures for evaluating student performance and grading were explained. 90.5%
16. Expectations of students including, but not limited to attendance, make-up work, and honor code policies were clearly explained. 94.4%
17. The course objectives were accomplished. 91.8%
18. Exams and quizzes were designed to test the course outcomes (covered appropriate subject matter). 89.2%
19. The required text(s) were valuable in contributing to my overall understanding of the course content. 88.9%
20. The labs demonstrated and reinforced the course objectives. 88.3%

Summary of Achievement of Intended Student Learning Outcomes:

Intended Student Learning Outcomes	Learning Assessment Measures							
	Direct Measure 1	Direct Measure 2	Direct Measure 3	Direct Measure 4	Indirect Measure 1	Indirect Measure 2	Indirect Measure 3	Indirect Measure 4
Program ISLOs	Performance Target Was...	Performance Target Was...	Performance Target Was...	Performance Target Was...	Performance Target Was...	Performance Target Was...	Performance Target Was...	Performance Target Was...
1. Graduates will be able to explain the major concepts in the functional areas of core business courses.	Met	Met			Met	Met		
2. Graduates will be able to explain and evaluate possible economic, social, legal,	Met	Met			Met	Met		

ethical, and environmental impacts of their business solutions in a global environment in a management role.					
3. Graduates will be able to describe the global business environment.	Met	Met		Met	Met
4. Graduates will be able to employ decision-support tools to business decision-making.	Met	Met		Met	Met
5. Graduates will be able to demonstrate a mastery of traditional and technological techniques of communicating ideas effectively and persuasively.	Met	Met		Met	Met
6. Graduates will be able demonstrate knowledge as it relates to the BSBA core courses in an integrated manner within a global business environment.	Met	Met		Met	Met

Proposed Courses of Action for Improvement in Learning Outcomes for which Performance Targets Were Not Met:

N/A.

Student Learning Assessment for the Bachelor of Science in Management of Cyber and Information Technology (BS MCIT)

Program Intended Student Learning Outcomes (Program ISLOs)

1. Graduates will be able to explain the major concepts in the functional areas of the degree program.

2. Graduates will be able to demonstrate a working knowledge of cybersecurity.

3. Graduates will be able to explain and evaluate possible economic, social, legal, ethical, and environmental impacts of their business solutions in a global environment in a management role.

4. Graduates will be able to describe the global business environment.

5. Graduates will be able to employ decision-support tools to business decision making.

6. Graduates will be able to demonstrate a mastery of traditional and technological techniques of communicating ideas effectively and persuasively.

7. Graduates will be able to demonstrate in depth knowledge as it relates to the core business courses in an integrated manner within a global environment.

8. Graduates will be able to collaborate with a team of colleagues on diverse projects.

Assessment Instruments for Intended Student Learning Outcomes—Direct Measures of Student Learning:	Performance Objectives (Targets/Criteria) for Direct Measures:
1. Capstone Strategic Management (BUS 410) Case Study Program ISLOs Assessed by this Measure: 1, 2, 3, 4, 5, 6	At least 75% of the students will score 70% or higher on the case study evaluation rubric.
2. Capstone Senior Project (BUS 458) Program ISLOs Assessed by this Measure: 1, 2, 4, 5, 6	At least 75% of graduating seniors will score 80% or higher on the Capstone Senior Project evaluation rubric.

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Assessment Instruments for Intended Student Learning Outcomes—Indirect Measures of Student Learning:	Performance Objectives (Targets/Criteria) for Indirect Measures:
1. Graduating Student Survey (Undergraduate) Program ISLOs Assessed by this Measure: 1, 2, 3 4, 5, 6	On the exit survey instrument, at least 75% of graduating seniors in management will indicate that they were "successful" or "very successful" in achieving the intended learning outcomes.
2. End-of-course survey (contains overall course and curriculum questions) Program ISLOs Assessed by this Measure: 1, 2, 3, 4, 5, 6	At least 70% of the students "agree" or "strongly agree" that the overall quality of the course has met their expectations of quality and intended learning outcomes of the course.

Assessment Results: Bachelor of Science in Management of Cyber and Information Technology (BS MCIT)

Summary of Results from Implementing Direct Measures of Student Learning:

1. <u>Capstone Strategic Management (BUS 410) Case Study:</u>

Percentage of Students Achieving a Score of 70% or Higher on the Capstone Strategic Management Case Study:

Capstone Strategic Management Case Study (Program ISLO 1, 2, 3, 4, 5, 6, 7, 8):   100% of Total   (Class average score: 93.3%)

2. <u>Capstone Senior Project (BUS 458):</u>

Percentage of Students Achieving a Score of 80% or Higher on the Capstone Senior Project:

Capstone Senior Project (Program ISLO 1, 2, 3, 4, 5, 6, 7, 8):   100% of Total   (Class average score: 99%)

Summary of Results from Implementing Indirect Measures of Student Learning:

1. **Graduating Student Survey (Undergraduate):**

   1. **ISLO #1**
      Understanding of issues related to my profession — 85.7%
      Ability to identify, formulate and solve business problems — 85.7%

   2. **ISLO #2**
      Understanding of issues related to my profession — 85.7%
      Ability to use current technological tools relating to the business environment — 71.4%
      Ability to analyze and interpret data — 71.4%

   3. **ISLO #3**
      Ability to make timely and informed decisions — 85.7%
      Ability to apply appropriate business knowledge in an integrated manner within a global environment — 85.7%

   4. **ISLO #4**
      Understanding of issues related to my profession — 85.7%
      Ability to apply appropriate business knowledge in an integrated manner within a global environment — 85.7%

   5. **ISLO #5**
      Ability to use appropriate business tools to solve problems — 100%
      Ability to use current technological tools relating to the business environment — 71.4%
      Ability to analyze and interpret data — 71.4%
      Ability to apply management skills to business problem — 100%

   6. **ISLO #6**
      Ability to apply project management principles — 85.7%
      Ability to present information effectively using current technology — 100%
      Ability to prepare formal business communications (letters, memos, reports) — 71.4%

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7. **ISLO #7**
   Ability to design and use research tools (questionnaires, surveys, interviews)   85.7%
   Ability to apply appropriate business knowledge in an integrated manner within a global environment   85.7%
   Ability to design a system or process to meet desired needs   85.7%

8. **ISLO #8**
   Understanding of issues related to my profession   85.7%
   Ability to identify, formulate and solve business problems   85.7%
   Ability to apply project management principles   85.7%
   Ability to present information effectively using current technology   100%

2. **End-of-course Survey:**
   (contains overall course questions, curriculum questions, and percentage of students who "agree" and "strongly agree")

   1. The instructor was well prepared to present and discuss course material.   88.4%
   2. The instructor presented content in a systematic and organized fashion, relating parts to the whole.   89.3%
   3. The instructor used supplemental technology to present material (ex., audio visual aids, Canvas, www, etc.)   93.9%
   4. The instructor posed questions to students designed to promote critical thinking and analysis.   94.5%
   5. The instructor promoted free-flow of communication: instructor and student, and between students.   90.7%
   6. The instructor introduced divergent viewpoints in areas where different points of view exist.   88.5%
   7. The instructor clarified abstract and complex ideas, using examples within students   89%
   8. The instructor periodically evaluated students.   89.2%
   9. The instructor assigned homework which reinforces the lecture materials.   87.5%
   10. The instructor provided useful feedback on submitted materials.   86.2%
   11. The instructor was available outside of scheduled class hours.   81.4%
   12. Course objectives were clearly defined.   89.4%

13. Dates for the submission of major materials were specified.   87.9%
14. Guidelines and requirements for presentations and written assignments were clearly stated.   88.4%
15. Clear, well-developed policies and procedures for evaluating student performance and grading were explained.   90.5%
16. Expectations of students including, but not limited to attendance, make-up work, and honor code policies were clearly explained.   94.4%
17. The course objectives were accomplished.   91.8%
18. Exams and quizzes were designed to test the course outcomes (covered appropriate subject matter).   89.2%
19. The required text(s) were valuable in contributing to my overall understanding of the course content.   88.9%
20. The labs demonstrated and reinforced the course objectives.   88.3%

Summary of Achievement of Intended Student Learning Outcomes:

Intended Student Learning Outcomes	Learning Assessment Measures							
Program ISLOs	Direct Measure 1	Direct Measure 2	Direct Measure 3	Direct Measure 4	Indirect Measure 1	Indirect Measure 2	Indirect Measure 3	Indirect Measure 4
	Performance Target Was...	Performance Target Was...	Performance Target Was...	Performance Target Was...	Performance Target Was...	Performance Target Was...	Performance Target Was...	Performance Target Was...
1. Graduates will be able to explain the major concepts in the functional areas of the degree program.	Met	Met			Met	Met		
2. Graduates will be able to demonstrate a working knowledge of cybersecurity.	NA	Met			Met	Met		
3. Graduates will be able to	Met	Met			Met	Met		

Outcome					
explain and evaluate possible economic, social, legal, ethical, and environmental impacts of their business solutions in a global environment in a management role.					
4. Graduates will be able to describe the global business environment.	Met	Met		Met	Met
5. Graduates will be able to employ decision-support tools to business decision making.	Met	Met		Met	Met
6. Graduates will be able to demonstrate a mastery of traditional and technological techniques of communicating ideas effectively and persuasively.	Met	Met		Met	Met
7. Graduates will be able to demonstrate in depth knowledge as it relates to the core business courses in an integrated manner within a global environment.	Met	Met		Met	Met

8. Graduates will be able to collaborate with a team of colleagues on diverse projects.	Met	Met	Met	Met

Proposed Courses of Action for Improvement in Learning Outcomes for which Performance Targets Were Not Met:

1. Program ISLO 2: Program ISLO 2 is not currently measured in BUS-410, but is currently measured in IAE-301, Comprehensive Computer Network Security. In the future, we will modify the Capstone Strategic Management Case Study in BUS-410 for the BS MCIT students. The modified Capstone Strategic Management Case Study for BS MCIT students will include the requirement to demonstrate a working knowledge of cybersecurity (i.e., Program ISLO 2) within the case study.

2. **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:

The **Bachelor of Science (B.S.) in Facilities Management and Critical Infrastructure** curriculum is designed to meet the needs of industry and government. The **B.S. in Facilities Management and Critical Infrastructure** program combines education and experience in both technical and managerial skills to prepare students for leadership roles in the Facilities Management and Critical Infrastructure protection professions. Laboratory work supplements classroom lectures to provide practical and useful skills. Students gain additional real-world experience through participation in a required internship. With its comprehensive, management-oriented focus on facilities and critical infrastructure training, the program helps students understand the impact of facilities on improving the quality of life, productivity of the core business, environment, and society. The program prepares students to be leaders in this exciting field.

The **B.S. in Facilities Management and Critical Infrastructure** will also help prepare the student to earn the Facility Management Professional™ (FMP®), Certified Facility Manager® (CFM®), Sustainability Facility Professional® (SFP®), and RICS Chartered Qualification (MRICS) certifications.

Description of program requirements:

Entrance requirements:

Students must be accepted in to the University in order to be accepted in to the program.

Degree Requirements:

The following is a list of courses for the **B.S. in Facilities Management and Critical Infrastructure** degree. Students expecting to complete this degree must meet all prerequisites for the courses listed below.

<div align="center">

Facilities Management and Critical Infrastructure
Courses
Total Credits: 121

</div>

<div align="center">

FACILITIES MANAGEMENT CORE COURSES – 39 CREDITS

</div>

FM-120 - Introduction to Facilities Management (3 Credits)
This course examines the scope of the professional facilities manager's responsibilities. The Facility Manager's role in relation to an organization's overall plan. An overview is provided of the fundamental concepts in facilities management and a general understanding of the responsibilities of the profession as to why it is valuable to facility managers. The type of facilities associated with critical infrastructures will be covered. An overview of concepts needed to organize, monitor, communicate and develop a good facilities management program will be introduced. Prerequisite: None.

CM-125 - Construction Graphics and Plan Reading (3 Credits)

This is an introductory course designed to prepare students to identify, read and interpret construction drawings. The course will be delivered from an applied perspective with an emphasis on understanding the processes involved in construction and interpreting them from drawings. Prerequisite: CM-120 or FM-120.

CM-220 - Construction Methods and Materials (3 Credits)

Vertical construction emphasizing comprehensive analysis of materials, design and specifications, installation methods, testing and inspection, and appropriate construction methodology for application. Prerequisite: CM-120 and MA-114.

CM-230 - Estimating I (3 Credits)

Introduction to the classification of work from plans and specifications. Covers discussion of the estimating function and review and applications of material quantity survey techniques used in estimating costs of construction projects. Includes types of approximate and precise methods of estimating and their uses, and computer applications. Prerequisite: CM-125.

CM-250 – Legal Issues in Construction (3 Credits)

An overview of standard construction contracts traditionally used between contractors, owners, design professionals and subcontractors from a general contractor's point of view. Prerequisite: CM-220.

FM-260 – Space Planning (3 Credits)

The process of design, problem solving, and building management as it relates to the use of interior space will be introduced. Projects involving issues pertaining to space planning, regulatory codes, building systems, material use and construction methods will be applied. Prerequisite: FM-120.

CM-270 – Safety Management (3 Credits)

Covers OSHA liability, general safety, hazard communication, fire, material handling, tools, welding, electricity, scaffolding, fall protection, cranes, heavy equipment, excavation, concrete, ladders and stairways, confined space entry, personal protective equipment, and health hazards. Prerequisite: CM-120.

FM-301 – Facilities Project Management (3 Credits)

Methods, concepts and procedures of project management as it relates to facilities. Scheduling, budgeting/estimating, contract administration, purchasing, relocations, move management, and identifying a team to manage the facilities will be introduced. Prerequisite: FM-120, CM-125, and CM-250.

FM-330 – Building Operations (3 Credits)

An examination of how facilities, building operations, and maintenance organizations are managed. An understanding of scheduling, equipment evaluation, training and long range planning of facilities. An in-depth look at the interdependent mechanical systems in a facility working together and how all the elements of a facility work together to function for the best

value to the organization. Prerequisite: FM-301.

FM-350 – Facilities Assessment and Forecasting (3 Credits)
This course emphasizes the strategic role required of the facilities manager in providing information for corporate managers and executives for facility forecasting. Topics include corporate real estate, attorney and developer interface, operating budgets and capital expenditures, and building performance assessment. Prerequisite: CM-125.

CM-375 - Mechanical and Electrical Construction (3 Credits)
An introduction to the basics of mechanical, electrical, plumbing and fire protection systems (MEP) in construction. This includes installation of systems and the necessary resources. Prerequisite: CM-220.

FM-380 – Facilities Energy and Sustainability (3 Credits)
An overview of how facilities, building operations, and maintenance organizations are managed to understand energy creation, delivery and consumption. Topics include sources, forms, and methods used to assess and manage energy use in buildings. Current building energy management software is evaluated. Students will apply concepts needed to successfully organize, monitor, communicate and develop a good sustainability program. Prerequisite: CM-125.

FM-450 – Principles of Real Estate (3 Credits)
Real estate concepts related to facilities are examined. Topics include real estate financial management, site selection, master planning, leasing, purchase vs. lease, property management and highest and best use analysis. Prerequisite: CM-125.

CRITICAL INFRASTRUCTURE CORE – 9 CREDITS

CRI-210 - Critical Infrastructure I (3 Credits)
This course will introduce participants to the key terms, policy, guidance, and preparedness efforts required to safeguard the Nation's critical infrastructure. Students will learn relevant policy and guidance, discuss the risk management framework, describe Federal critical infrastructure security and resilience and information sharing programs, and relate critical infrastructure programs to individual actions. Primary focus will be on incorporating Critical Infrastructure protection in to construction of facilities in six of the sixteen critical infrastructure sectors: chemical facilities, commercial (e.g., retail, entertainment, lodging), communications facilities, critical manufacturing facilities, dams, and energy facilities. Students will complete hands-on Critical Infrastructure projects related to the construction of those types of facilities. Prerequisite: None.

CRI-310 - Critical Infrastructure II (3 Credits)
The national and economic security of the United States depends on the reliable functioning of critical infrastructure. This course examines collaboration efforts among the entities responsible for constructing physical and cybersecurity protection as well as the development of integrated risk management strategies for our Nation's critical infrastructure. Primary focus will be on incorporating Critical Infrastructure protection in to construction and renovation of facilities in five of the sixteen critical infrastructure sectors: Defense industrial facilities, emergency services facilities, financial services facilities, government facilities, and public healthcare facilities.

Students will complete hands-on Critical Infrastructure projects related to the construction and renovation of those types of facilities. Prerequisite: CI-210.

CRI-410 - Critical Infrastructure III (3 Credits)

This course will explore how threats, vulnerabilities, and consequences determine risk as it relates to the protection of Critical Infrastructure. Primary focus will be on incorporating Critical Infrastructure protection in to construction of facilities in five of the sixteen critical infrastructure sectors: food and agriculture facilities, Information Technology facilities, nuclear facilities, transportation facilities, and water/wastewater facilities. Students will complete hands-on Critical Infrastructure projects related to the construction, hardening, and recovery of those types of facilities. Prerequisite: CI-310.

GENERAL EDUCATION – 46 CREDITS

MATHEMATICS AND SCIENCE COURSES - 19 CREDITS

MA-112 Intermediate Algebra (3 Credits)

Designed for students needing mathematical skills and concepts for MA-114 and MA-261. Students are introduced to equations and inequalities, learn the language of algebra and related functions, including polynomial, rational, exponential and logarithmic functions. Other topics include solving equations, inequalities and systems of linear equations; performing operations with real numbers, complex numbers and functions; constructing and analyzing graphs of functions; and using mathematical modeling to solve application problems. Prerequisite: MA-005 or acceptance based on placement test scores.

MA-114 Algebra and Trigonometry (4 Credits)

Designed for students needing mathematical skills and concepts for MA-261. Topics covered in algebra include algebra: basic operations on real and complex numbers, fractions, exponents and radicals, determinates, solution of linear, fractional, quadratic and system equations. Topics covered in trigonometry include definition and identities, angular measurements, solving triangles, vectors, graphs and logarithms. Prerequisite: MA-112 or acceptance based on placement test score.

MA-128 Introduction to Statistics (3 Credits)

Topics covered in probability include definitions, theorems, permutations and combinations. Binomial, hypergeometric, Poisson and normal distributions. Topics covered in sampling include distribution and central limit theorem, estimation and hypothesis testing. Prerequisite: MA-114.

PH-201 General Physics I (3 Credits)

Non-calculus based physics. The course focuses on Mechanics: units, conversion factors: vector diagrams, translational equilibrium, friction, torque and rotational equilibrium: uniformly accelerated motion, projectiles: Newton's Law, work energy and power: kinetic and potential energy, conservation of energy: impulse and momentum. Heat: temperature scales, thermal properties of matter, heat and temperature change, heat and change of phase, physics of heat transfer; applications. Prerequisite: MA-114.

CH-120 Chemistry (3 Credits)

Metric system and significant figures; stoichiometry; fundamental concepts of atomic structure and its relationship to the periodic table; electron configuration; bonds and electronegativity; gases; oxidation states and redox; solutions, acids and bases, changes of state, thermodynamics, chemical kinetics and equilibrium. Prerequisite: MA-114.

UAS-101 Introduction to Unmanned and Autonomous Systems (3 Credits)

This course presents an introduction to Unmanned and Autonomous Systems operations. This includes a historical perspective and background information of this system including its modeling and control fundamentals, ground based systems, visual and electro-optical aspects of navigation, obstacle and terrain avoidance systems, modular on-board processing systems, and current applications. This course also exposes students to the significant regulations impacting unmanned systems operations. Prerequisite: None.

ENGLISH, HUMANITIES AND SOCIAL SCIENCE COURSES - 27 CREDITS

EN-101 English Communications I (3 Credits)

This introductory college-level course focuses on effective oral and written communication skills and the development of analytical abilities through various reading and writing assignments. Students must demonstrate competence in writing mechanics, including grammar, sentence structure, logical content development, and research documentation through 2 essays and 2 research papers. Rhetorical modes may include description, comparison/contrast, narrative, and process analysis. Students are expected to develop effective oral communication skills through speeches. Group projects will develop effective team skills such as decision-making, time management, and cooperation. Prerequisites: acceptance based on placement test scores.

EN-102 English Communications II (3 Credits)

This sequel to EN-101 involves more sophisticated reading, writing, speaking, and research assignments. Students must demonstrate competence in writing mechanics, as well as advanced research skills, the ability to handle complex information, and effective team skills. Students write research papers: an information paper, a cause-and-effect paper, an argument paper, and a final research paper. Course includes group work. Presentations are required. Prerequisite: EN-101.

BUS-200 Business Communications and Negotiation (3 Credits)

This course includes preparation for various kinds of both written and oral business communication. The course will develop and sharpen the critical thinking and writing skills, including report/proposal preparation and presentation, needed in the workplace. Strategies for effective communication and negotiation will also be explored. Prerequisite: EN-101.

BUS-279 Introduction to Leadership (3 Credits)

This course overviews the disciplines and competencies associated with leadership in the 21st century. The study and application of skills, theories, and concepts in a multicultural society will be examined. This is a seminar course with emphasis on class discussion and collaborative learning. Prerequisite: BUS-174, Corequisite EN-101.

BUS-282 Economics for Management (3 Credits)

This course is an introduction to economic concepts and analysis. It deals with the relationship between government, business, and the overall economy. The key areas focused on include gross domestic product, the public sector, unemployment, and aggregate supply and demand. The global economy is covered with discussion of issues such as international trade and protectionism. Prerequisite: EN-101

HU-331 Arts and Ideas (3 Credits)

This course enables students to study and appreciate various forms of art, including painting, sculpture, architecture, music, drama, film, and literature through in-class and on-site experiences. The arts are also surveyed from an historical perspective, focusing primarily on eras in Western civilization. This enables students to sense the parallel development of the arts, of philosophy, and of sociopolitical systems and to recognize various ways of viewing reality. Prerequisite: EN-102.

SS-351 Ethics (3 Credits)

This course is designed to help students improve their ability to make ethical decisions. This is done by providing a framework that enables the student to identify, analyze, and resolve ethical issues that arise when making decisions. Case analysis is a primary tool of this course. Prerequisite: EN-102.

Humanities Electives (3 Credits)

Social Science Elective (3 Credits)

MANAGEMENT AND BUSINESS COURSES – 9 CREDITS

BUS-270 Financial Accounting I (3 Credits)

This is an introductory accounting course that will provide students with a strong basic knowledge of accounting terms, concepts, and procedures. Analyzing business transactions as they relate to the General Ledger and the use of special journals will be addressed as well as the various processes and procedures related to the full accounting cycle. The accounting principles described are those endorsed by the Financial Accounting Standards Board. Corequisite: MA-112.

BUS-283 Managerial Accounting (3 Credits)

This course focuses on budgeting and planning. Emphasis is on the use of accounting information to plan and redirect allocations to support business decisions. Managerial Accounting is designed to follow Principles of Accounting. Prerequisite: BUS-270.

BUS-454 International Business (3 Credits)

Drawing upon previous management and business courses, this course studies the nature and scope of international trade and investment, international institutions, the international monetary system and exchange markets, and the cultural factor affecting international business operations and their influence on the principal business functions. The effects of the revolution in electronic

technologies on global business are also examined. Case study analysis and a variety of current media are used in this course. Prerequisites: BUS-372, BUS-376 and BUS-386.

CYBERSECURITY COURSES – 12 CREDITS

CT-152 Introduction to UNIX (3 Credits)
This course focuses on the Unix file and operating system. Understanding multi-user and multitasking concepts. Editors, X-windows, Awk, email, Internet commands, shell commands and shell scripts. Projects, which provide practical experience, are completed as part of the homework requirements.

IAE-201 Introduction to IA Concepts (3 Credits)
This course covers topics related to administration of network security. Topics include a survey of encryption and authentication algorithms; threats to security; operating system security; IP security; user authentication schemes; web security; email security protocols; intrusion detections; viruses; firewalls; Virtual Private Networks; network management and security policies and procedures. Laboratory projects are assigned as part of the homework requirements. This course prepares students for the (ISC)2 Systems Security Certified Practitioner (SSCP) Certification. Corequisites: MA-110 or MA-112 or MA-114 or MA-261.

IAE-301 Comprehensive Computer and Network Security (3 Credits)
Building on IAE-201, this course provides learners with detailed and hands-on knowledge of computer and network security. The course emphasizes current topics such as network security, compliance and operational security, threats and vulnerabilities, application security, access control, as well as cryptography. Additionally, underlying theory and concepts are presented to extend learners' understanding of computer and network security. Weekly laboratory exercises are utilized to reinforce practical, real-world security techniques. Classes are a mixture of lecture, current event discussions, and laboratory exercise review and will prepare learners for the CompTIA Security+ certification. Prerequisite: IAE-201.

IAE-321 Applied Wireless Network Security (3 Credits)
This course will explore the unique challenges presented by wireless networking, including the management of dual network devices (Bluetooth, 3G, 4G, and WiFi). Students will evaluate emerging business and technical initiatives, such as bring your own device (BYOD) and securely implement mobile IP networks based on IPv4, IPv6 and the 3GPP. Students will learn penetration testing strategies to effectively evaluate currently implemented security controls, utilizing cutting edge tools such as BackTrack 5, Vistumbler, Wireshark, and inSIDDer for network discovery and packet analysis. Additionally, students will be exposed to the site survey, network management and analysis capabilities of industry leading software such as Air Magnet, Ekahau and OmniPeek. Students are required to purchase an Alfa wireless adapter and acquire a wireless router for this class. This course prepares students for the Certified Wireless Security Professional (CWSP) Certification. Prerequisites: IAE-301, CT-152.

FM-457 Internship in Facilities Management (3 Credits)

Successful completion of an approved internship is a graduation requirement. The internship program complements classroom learning by exposing students to various facilities management functions on real-life projects. Prerequisite: Senior standing and Department Chair approval.

FM-458 Senior Design Project (3 Credits)

Student will propose, design, write and present a project manual for a successful facilities manager managing a large facility that would be considered critical in the event that it was not operating properly. Prerequisite: FM-457, Senior standing, and Department Chair approval.

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

   The general education requirements meet or exceed the specifications in The Code of Maryland Regulations (COMAR). Please see Section G.4 to review the general education requirements for the proposed degree.

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). The program will also receive specialized accreditation by International Accreditation Council for Business Education (IACBE) for its management and leadership content. Capitol Technology University is currently accredited by both organizations. The program will also receive specialized accreditation by the Facilities Management Accreditation Commission (FMAC) for its facilities management content.

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 for this degree.

6. **Provide assurance and any appropriate evidence that the proposed program will 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.**

   The **B.S. in Facilities Management and Critical Infrastructure** program will 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, aircraft, availability of academic support services and financial aid resources, and costs and payment policies.

   Curriculum, course, and degree information will be available on the University website and via e-mail as well as regular mail (by request). The expectations on 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 with professors, in the on-ground classroom, and in the online environment to facilitate a high-level learning experience. Technology competence and skills and technical equipment requirements are part of the material distributed for each course. The technical equipment requirements are also listed on our website and provided to students in the welcome package.

The University's academic support services, financial aid resources, costs and payment policies, Learning Management System, are covered in the University Open Houses, application process, Welcome Aboard process, Orientation, Student Town Halls, and individual counseling.

7. **Provide assurance and any appropriate evidence that advertising, recruiting, and admissions materials will clearly and accurately represent the proposed program and the services available.**

The **B.S. in Facilities Management & Critical Infrastructure** program's advertising, recruiting, and admissions materials will clearly and accurately represent the proposed program and the services available. The material for every new degree program is derived from the new program proposal approved by the Maryland Higher Education Commission.

H. Adequacy of Articulation:

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

This program does not have articulation partners currently. However, it is expected that articulation for the program 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 the number transfer credits (as allowable). There are dedicated transfer student personnel 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 the faculty with appointment type, terminal degree title and field, academic title/rank, status (full-time, part-time, and 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. Dr. Antunes, Prof. Ashmall, Dr. Bajwa, Dr. Baker, Prof. Burke, Dr. Butler, and Dr. McAndrew are fulltime faculty members. Eighteen of the twenty-three faculty members hold terminal degrees. Prof. Morgan and Prof. Weideman are professionally qualified given their significant years of experience and positions held. Dr. Ford and Prof. Burke possess additional qualifications in Facilities Management (detailed below). Their resumes and curriculum vitae have reviewed and each one is deemed professionally qualified to teach their courses in this field and at this level. The University leadership is confident in the quality of the faculty and their abilities to provide a learning environment supportive of the University goals for student success. Additional

doctorally-qualified faculty will be added as needed.

Instructors who will be engaged with the **B.S. in Facilities Management and Critical Infrastructure** degree:

INSTRUCTOR	BACKGROUND	COURSES ALIGNED TO BE TAUGHT
Dr. Alex Antunes Full time	Ph.D. Computational Astrophysics M.S. Astronomy B.S. Astronomy and Physics	All CS courses
Lt. Col. Soren Ashmall, USMC (Ret.) Full time	M.A. Broadcast Journalism B.A. Theatre MOS 3450 Planning, Programming, & Budget Systems Officer MOS 8055 Information Management Officer MOS 0202 Intelligence Officer MOS 2602 Signals Intelligence Officer/Ground Electronic Warfare Officer Licensed Real Estate Agent/REALTOR Facilities Security Officer, National Industrial Security Program (NISP)	All Liberal Arts and Humanities EN-101 EN-102
Dr. Garima Bajwa Full time	Ph.D. Computer Science and Engineering M.S. Electrical and Computer Engineering B.S. Electronics and Communication Engineering	CT-152
Dr. Hasna Banu Adjunct	Ph.D. Theoretical Physics M.S. Mathematics B.S. Mathematics	All MA courses
Dr. Richard Baker Full time	Ph.D. Information Systems M.S. Computer Science B.S. Mathematics F-4 Pilot	UAS-101
Dr. Malcolm Beckett Adjunct	D.B.A. Quality Systems Management in Homeland Security and Defense M.S. Information Systems Management B.S. Criminal Justice CISSP PMP	IAE-201, IAE-301, IAE-321 CRI-210, CRI-310, CRI-410
Mr. Gary Burke Full time	M.B.A. B.S. Building Science OHST	All FM, SAF and CM courses
Dr. William Butler Full time	D.Sc. Cybersecurity M.S. Strategic Studies B.S. Computer Science NSTISSI No. 4011 CNSSI No. 4012 NSTISSI No. 4015 CNSSI No. 4016	IAE-201, IAE-301, IAE-321 CRI-210, CRI-310, CRI-410

Dr. Craig Capano Adjunct	Ph.D. Civil Engineering with Concentration in Construction Engineering and Management and a focus on Business M.C.S.M. (Master of Construction Science and Management) B.S. Construction Management A.S. Architectural Engineering	All FM and CM courses CRI-210, CRI-310, CRI-410
Dr. Jami Carroll Adjunct	D.Sc. Cybersecurity M.S. Network Security M.B.A. B.B.A.	IAE-201, IAE-301, IAE-321 All BUS courses
Dr. Emily Darraj Adjunct	D.Sc. Cybersecurity M.S. E-Commerce Security B.A. Liberal Arts, English CICISO	IAE-201, IAE-301, IAE-321 All BUS courses
Dr. George Ford Adjunct	Ed.D. Educational Leadership M.E. Environmental Engineering M.B.A. B.S. Mechanical Engineering Professional Engineer (P.E.)	All FM courses CRI-210, CRI-310, CRI-410
Dr. Raymond Letteer Adjunct	D.Sc. Cyber Security M.S. Network Security/Information Assurance B.A. Political Science A.A.S. Communications Technology	IAE-201, IAE-301, IAE-321 CRI-210, CRI-310, CRI-410
Dr. Priscilla Lewis Adjunct	D.M. Leadership M.B.A. M.P.S. Managerial Policy B.S. Economics/Mathematics	All BUS courses
Dr. Ronald Mau Adjunct	Ph.D. Business M.B.A. M.S. Civil Engineering B.S. Civil Engineering	All FM and CM courses CRI-210, CRI-310, CRI-410
Mr. Sam Morgan III Adjunct	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)	UAS-101
Dr. Mark Moss Adjunct	Ph.D. Computer Science M.S. Computer Science B.S. Mathematics	All CS courses

Pamela Opeka Full time	M.Ed. Curriculum and Instruction B.S. Biology and Chemistry	MA-112, MA-114, MA-128
Mr. Mark Opeka Adjunct	Ph.D. Materials Engineering M.S. Materials Engineering B.S. Mechanical Engineering	CH-120, CM-220, CM-260
Dr. Alexander Perry Adjunct	D.Sc. Cybersecurity M.S. Applied and Computational Mathematics B.S. Applied Mathematics CISSP	IAE-201, IAE-301, IAE-321 CRI-210, CRI-310, CRI-410 All Math courses
Dr. Bradford Sims Full time	Ph.D. Curriculum Instruction Design M.S. Building Construction Management B.S. Building Construction Technology	All FM and CM courses CRI-210, CRI-310, CRI-410
Prof. Nathan Weideman Adjunct	M.S. Astronautical Engineering B.S. Professional Aeronautics	PH-201
Dr. Blake Wentz Adjunct	Ph.D. Technology Management with Construction Management Focus M.E. Construction Management B.S. Business Administration with Finance Major Certified Professional Constructor (CPC) Leadership in Energy and Environmental Design (LEED) Advanced Professional (AP)	All FM and CM courses CRI-210, CRI-310, CRI-410
To Be Hired—5 Adjunct Faculty in Facilities Management	Ph.D. preferred, minimum of M.S. in Facilities Management, Building Management, or directly related field	All FM courses CRI-210, CRI-310, CRI-410

ADDITIONAL JUSTIFICATION:
Capitol Technology University's instructors are leading experts in the Facilities Management and Critical Infrastructure fields. The following is additional justification for two of the faculty members:

1. Mr. Gary Burke has forty years of experience either working in the facilities and construction industry or teaching related courses. He is a certified OSHA authorized construction trainer and managed his own residential construction company as a licensed general contractor for fourteen years where job site safety was part of his daily responsibility. He has also been a facilities management director. He is a full-time Associate Professor with Capitol Technology University with program oversight.

2. Dr. George Ford has a background of being a facilities manager for several manufacturing facilities. He also taught facilities management courses at Western Carolina University for a number of years. Dr. Ford is known for providing innovative real world projects in his facilities management classes.

2. **Demonstrate how the institution will provide ongoing pedagogy training for faculty in evidenced-based best practices, including training in:**

a) Pedagogy that meets the needs of the students

The primary pedadogy for faculty at Capitol Technology University is the Active Learning model. The university believes strongly in a highly-interactive, thinking, and hands-on experience for students in each class to the maximum extent possible.

> It was two Missouri State professors, historian Charles Bonwell and psychologist James Eison, who coined the term "active learning." In their 1991 book on the subject, Active Learning: Creating Excitement in the Classroom, they offered this definition of the concept: "active learning involves students in doing things and thinking about the things they are doing."

> The definition, though it seems circuitous, marks a definitive pedagogical shift in college teaching and learning. Rather than think about what they are watching, hearing, or reading, students are first encouraged to be "doing" something in class, and then to apply critical thought and reflection to their own classroom work and activity. Their argument was backed up by research. Even Bligh, 20 years earlier, had pointed out that the immediate rehearsal of new information and knowledge had a significant impact upon learning.

> This approach is as helpful in the sciences as it is in the arts or humanities: whether it's organic chemistry, creative writing, or behavioral economics, concepts are all best understood through repeated practice and open, social exploration. The central tenet of active learning is that practice matters, and that classroom time is better spent giving students opportunities to work with concepts over and over, in a variety of ways and with opportunities.

> The central tenet of active learning — that practice and interaction matters— can be applied across disciplines for immediate feedback, so that knowledge can take hold in their own minds.

> (Source: Preville, P. Active Learning: The Perfect Pedagogy for the Digital Classroom: An Essential Guide for the Modern Professor)

All faculty receive regular periodic and recurring pedagogical training during the academic year. Those training sessions occur in a hybrid format – simultaneously live online and live on-ground in the classroom. The sessions are designed to reach all faculty, both fulltime and adjunct, in order to ensure all members receive the training. Additionally, the sessions are recorded for those faculty who are unable to attend the live training session due to other professional commitments and who are teaching classes.

b) The learning management system

The Department of Online Learning (formerly the university's Department of Distance Learning) and the instructional technology division support the online program needs of faculty and students. Those University organizations and the IT Help Desk provide constant and on-going

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 that 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 the faculty member and, in turn, students attending online classes.

c) **Evidenced-based best practices for distance education, if distance education is offered.**

Faculty at Capitol Technology University receive training in Keller's ARCS Motivational Model and his associated strategies for distance education/online learning.

> A model used in online delivery of teaching and learning to increase learner motivation is the Keller's ARCS motivational model. This model has been considered an important element in online education because of its implications on increased learner motivation and learning outcomes. The Keller's model consists of motivating students by maintaining and eliciting attention (A), such as virtual clinical simulations; making the content and format relevant (R), by modeling enthusiasm or relating content to future use; facilitating student confidence (C), by providing "just the right challenge"; and promoting learner satisfaction (S), by providing reinforcement and praise when appropriate. Examples of the Keller's model include increasing motivation including the arousal of curiosity of students, making the connection between learning objectives and future learning goals, autonomous thinking and learning, and fostering student satisfaction. Keller's ARCS model has been researched by various educational online programs to analyze student motivation and learning outcomes. The Keller's model serves as an example and guide for instructors to motivate and increase online engagement with their students as wells as research purposes.

> A qualitative study by Chan Lin investigated online student learning and motivation. Discussion boards, student projects, and reflection data were collected and analyzed from a 12-week web-based course. Respondents indicated the importance of online feedback from the instructor and peer modeling of course tasks to visualize learning progress. The study revealed using Keller's ARCS strategies fosters greater student online engagement by fostering self-efficacy and a sense of accomplishment.

> In a mixed method study, assessing the use of Keller's ARCS on instructional design, the use of educational scaffolding fostered positive levels of student motivation. Relevancy, attention, confidence, and satisfaction were all common factors associated with student success in the course and course completion.

> (Source: Pinchevsky-Font T, Dunbar S. Best Practices for Online Teaching and Learning in Health Care Related Programs. The Internet Journal of Allied Health Sciences and Practice. January 2015. Volume 13 Number 1.)

All faculty receive regular periodic and recurring training on evidence-based practices for distance education/online learning during the academic year. Those training sessions occur in a hybrid format – simultaneously live online and live on-ground in the classroom. The sessions are designed to reach all faculty, both fulltime and adjunct, to ensure all members receive the

training. Additionally, the sessions are recorded for those faculty who are unable to attend the live training session due to other professional commitments or who are teaching classes at the training delivery time.

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 existing 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 Technology University 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 undergraduate level: B.S. in Astronautical Engineering, B.S. in Business Analytics and Data Science, B.S. in Computer Engineering, B.S. in Computer Engineering Technology, B.S. in Computer Science, B.S. in Construction Management and Critical Infrastructure, B.S. Construction Safety, B.S. in Cyber Analytics, B.S. in Cybersecurity, B.S. in Electrical Engineering, B.S. in Electrical Engineering Technology, B.S. in Engineering Technology, B.S in Management of Cyber and Information Technology, B.S. in Mechatronics Engineering, B.S. in Mechatronics and Robotics Engineering Technology, B.S. in Mobile Computing, B.S. in Software Engineering, and B.S. in Technology and Business Management, and B.S in Unmanned and Autonomous Systems. The University's library is also supporting the following degrees at the graduate level: M.S. in Aviation, M.S. in Computer Science, M.S. in Critical Infrastructure, M.S. in Cyber Analytics, M.S. in Cybersecurity, M.S. in Engineering Technology, M.S. in Information Systems Management, M.S.in Internet Engineering, M.S. in Unmanned and Autonomous Systems Policy and Risk Management, M.B.A., T.M.B.A. Business Analytics and Data Science, T.M.B.A. in Cybersecurity, D.Sc. in Cybersecurity, Ph.D. in Aviation, Ph.D. in Business Analytics and Decision Sciences, Ph.D. in Construction Science, Ph.D. in Critical Infrastructure, Ph.D. in Manufacturing, Ph.D. in Occupational Health and Safety, Ph.D. in Technology, Ph.D. in Technology/M.S. in Research Methods Combination Program, and Ph.D. in Unmanned Systems Applications. Therefore, the library is fully prepared to support a **B.S. in Facilities Management & Critical Infrastructure.**

    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: https://www.captechu.edu/current-students/puente-library

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 undergraduate, 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 online class platform is web based and requires no additional equipment for the institution. The current Learning Management System, Canvas and Zoom (which will replace Adobe Connect during the Summer 2019), meets the needs of the degree program. The Business and Technology lab, Computer Science Lab, Cyber Lab, Robotics Lab, and Unmanned Systems Lab together meet the potential research needs of the students. The labs provide both local and virtual support.

2. **Provide assurance and any appropriate evidence that the institution will ensure students enrolled in and faculty teaching in distance education will have adequate access to:**

a) An institutional electronic mailing system

Capitol Technology University provides an institutional electronic mailing system to all students and faculty teaching. The capability is provided to all students and faculty in all of the institution's modalities of course delivery. Capitol Technology University students and faculty are required to use the institution's email addresses (e.g., xxxxxxxxx@captechu.edu) in all University matters and communications. The University uses the email capabilities in Microsoft

Office 365 and Microsoft Outlook.

b) A learning management system that provides the necessary technological support for distance education

Capitol Technology University provides a robust Learning Management Systems (LMS) through the use of the Canvas LMS by Instructure (www.canvaslms.com). The university pairs Canvas with Zoom (which will replace Adobe Connect during Summer 2019) in order to provide a platform for every student and faculty member to meet face-to-face in a synchronous "live" mode of communication. The use of Canvas is required for every course offered at the University; as a result, every course has a classroom on Canvas and Zoom All syllabi, grades, and assignments must be entered in to Canvas on a timely basis throughout the semester.

Canvas provides the world's most robust LMS. It is a 21st Century LMS; Canvas is a native cloud, Amazon Web Service hosted system. The system is adaptable, reliable, and customizable. Canvas is easy to use for students and faculty. The system is fully mobile and has proven to be time-saving when compared to other systems. The following list provides the features of the system:

<u>Time and Effort Savings</u>

- CANVAS DATA
  Canvas Data parses and aggregates more than 280 million rows of Canvas usage data generated daily.

- CANVAS COMMONS
  Canvas Commons makes sharing a whole lot easier.

- SPEEDGRADER ANNOTATIONS
  Preview student submissions and provide feedback all in one frame.

- GRAPHIC ANALYTICS REPORTING ENGINE
  Canvas Analytics help you turn rich learner data into meaningful insights to improve teaching and learning.

- INTEGRATED MEDIA RECORDER
  Record audio and video messages within Canvas.

- OUTCOMES
  Connect each learning outcome to a specific goal, so results are demonstrated in clearly measurable ways.

- MOBILE ANNOTATION
  Open, annotate, and submit assignments directly within the Canvas mobile app.

- AUTOMATED TASKS
  Course management is fast and easy with automated tasks.

- NOTIFICATION PREFERENCES

Receive course updates when and where you want - by email, text message, even Twitter or LinkedIn.

- **EASE OF USE**
  A familiar, intuitive interface means most users already have the skills they need to navigate, learn, and use Canvas.

- **IOS AND ANDROID**
  Engage students in learning anytime, anywhere from any computer or mobile device with a Web-standard browser.

- **USER-CUSTOMIZABLE NAVIGATION**
  Canvas intelligently adds course navigation links as teachers create courses.

- **RSS SUPPORT**
  Pull feeds from external sites into courses and push out secure feeds for all course activities.

- **DOWNLOAD AND UPLOAD FILES**
  Work in Canvas or work offline—it's up to you.

- **SPEEDGRADER**
  Grade assignments in half the time.

Student Engagement

- **ROBUST COURSE NOTIFICATIONS**
  Receive course updates when and where you want—by email, text message, and even Facebook.

- **PROFILE**
  Introduce yourself to classmates with a Canvas profile.

- **AUDIO AND VIDEO MESSAGES**
  Give better feedback and help students feel more connected with audio and video messages.

- **MULTIMEDIA INTEGRATIONS**
  Insert audio, video, text, images, and more at every learning contact point.

- **EMPOWER GROUPS WITH COLLABORATIVE WORKSPACES**
  By using the right technologies in the right ways, Canvas makes working together easier than ever.

- **MOBILE**
  Engage students in learning anytime, anywhere from iOS or Android, or any mobile device with a Web-standard browser.

- **TURN STUDENTS INTO CREATORS**

Students can create and share audio, video, and more within assignments, discussions, and collaborative workspaces.

- WEB CONFERENCING
  Engage in synchronous online communication.

- OPEN API
  With its open API, Canvas easily integrates with your IT ecosystem.

- BROWSER SUPPORT
  Connect to Canvas from any Web-standard browser.

- LTI INTEGRATIONS
  Use the tools you want with LTI integrations.

- MODERN WEB STANDARDS
  Canvas is built using the same Web technologies that power sites like Google, Facebook, and Twitter.

Lossless Learning

- CANVAS POLLS
  Gauge comprehension and incorporate formative assessment without the need for "clicker" devices.

- MAGICMARKER
  Track in real-time how students are performing and demonstrating their learning.

- QUIZ STATS
  Analyze and improve individual assessments and quiz questions.

- LEARNING MASTERY FOR STUDENTS
  Empower students to take control of their learning.

(Source: https://www.canvaslms.com/higher-education/features)

Capitol Technology University has been using Canvas for over four years. Canvas has proven to be a completely reliable LMS system that provides the necessary technological support for distance education/online learning.

L. Adequacy of Financial Resources with Documentation (as outlined in COMAR 13B.02.03.14):

1. Complete Table 1: Resources and Narrative Rationale. Provide finance data for the first five years of program implementation. Enter figures into each cell and provide a total for each year. Also provide a narrative rationale for each resource category. If resources have been or will be reallocated to support the proposed program, briefly discuss the sources of those funds.

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)	$383,593	$932,523	$1,366,006	$2,202,085	$3,166,665
a. Number of F/T Students	11	27	38	59	87
b. Annual tuition/Fee rate	$26,003	$26,393	$26,789	$27,191	$27,871
c. Total F/T Revenue (a x b)	$286,033	$712,611	$1,017,982	$1,604,269	$2,424,777
d. Number of P/T Students	10	22	34	57	69
e. Credit Hour Rate	$813	$833	$853	$874	$896
f. Annual Credit Hour	12	12	12	12	12
g. Total P/T Revenue (d x e x f)	$97,560	$219,912	$348,024	$597,816	$714,888
3. Grants, Contracts and Other External Sources	0	0	0	0	0
4.Other Sources	0	0	0	0	0
TOTAL (Add 1 – 4)	$383,593	$932,523	$1,366,006	$2,202,085	$3,166,665

This proposal builds upon an existing degree programs. A number of the courses exist within the other bachelor's degree programs currently offered by the University.

A. 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.

1. **Reallocated Funds**

The university will not need to reallocate funds for the program.

2. **Tuition and Fee Revenue**

Tuition is calculated to include an annual 2.5% tuition increase. A 20% attrition rate has

been calculated.

3. **Grants and Contracts**

There are currently no grants or contracts.

4. **Other Sources**

There are currently no other sources of funds.

5. **Total Year**

No additional explanation or comments needed.

2. **Complete Table 2: Program Expenditures. Provide finance data for the first five years of program implementation. Enter figures into each cell and provide a total for each year.**

TABLE 2: EXPENDITURES
Courses are taught by adjunct professors.

Expenditure Category	Year 1	Year 2	Year 3	Year 4	Year 5
1. Faculty (b + c below)	$32,670	$58,960	$69,067	$106,193	$145,133
a. Number of FTE	2	3.5	4	6	8
b. Total Salary	$27,392	$49,133	$57,556	$88,494	$120,944
c. Total Benefits (20% of salaries)	$5,278	$9,827	$11,511	$17,699	$24,189
2. Admin Staff (b + c below)	$4,798	$5,090	$5,243	$5,374	$5,508
a. Number of FTE	.07	.07	.07	.07	.07
b. Total Salary	$4,084	$4,207	$4,333	$4,441	$4,552
c. Total Benefits	$858	$883	$910	$933	$956
3. Support Staff (b + c below)	$57,475	$88,369	$114,950	$120,770	$185,676
a. Number of FTE	1.00	1.5	1.75	2	3
b. Total Salary	$47,500	$73,032	$83,125	$99,810	$153,450
c. Total Benefits	$9,975	$15,337	$16,625	$20,960	$32,226
4. Technical Support and Equipment	$1,260	$3,185	$5,040	$7,950	$12,486
5. Library	$0	$0	$0	$0	$0
6. New or Renovated Space	$0	$0	$0	$0	$0
7. Other Expenses	$38,359	$93,252	$136,600	$220,208	$316,666
TOTAL (ADD 1-7)	$134,562	$248,856	$330,900	$460,495	$665,469

1. **Provide a narrative rationale for each expenditure category. If expenditures 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 time period.

c. Support Staff

Capitol Technology University will add additional support staff to facilitate the program.

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 $60 per student in Year 1. The rate is estimated to increase by $5 per year.

e. Library

Money has been allocated for additional materials to be added to the on campus and virtual libraries to ensure the literature remains current and relevant. However, it has been determined that the current material serves the needs of this degree due to the extensive online database.

f. New or Renovated Space

No new or renovated space is required.

g. Other Expenses

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

M. Adequacy of Provisions for Evaluation of Program (as outlined in COMAR 13B.02.03.15):

1. **Discuss procedures for evaluating courses, faculty and student learning outcomes.**

   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.

   Academic Year Assessment Events:

   Fall Semester:

   - At the August Faculty Retreat, the faculty reviews any outstanding student learning challenges that have not been adequately addressed. The issues are brought to the Academic Deans for review and development of implementation plans.
   - Faculty submit performance plans consistent with the mission and goals of the University and department. The documents are reviewed and approved by the Academic Deans.
   - Department Chairs and Academic Deans review the Graduating Student Survey data.
   - Department Chairs and Academic Deans review student internship evaluations.
   - Department Chairs and Academic Deans review grade distribution reports from the spring and summer semesters.

- Department Chairs and Academic Deans 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 Academic Deans, faculty and the advisory boards will develop the most effective strategy to move the changes forward.

    o NOTE: A complete curriculum review for degrees occurs every 2 years. In most cases, the changes only require that the Academic Deans inform the University President 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 Executive Council.

- The Academic Deans attend the Student Town Hall and review student feedback with Department Chairs.
- Department Chairs conduct interviews with potential employers at our Career Fair.
- Post-residency, the Academic Deans meet with the faculty to review the student learning progress and discuss needed changes.

Spring Semester:

- Faculty Performance Plans are reviewed with faculty to identify issues of divergence and to adjust the plan as needed.
- Department Chairs and Academic Deans review grade distribution reports from the Fall Semester.
- Department Chairs and Academic Deans review the Graduating Student Survey data.
- Department Chairs and Academic Deans review student course evaluations from the Fall Semester and the Spring Semester (in May before the Summer Semester begins).
- Department Chairs and Academic Deans 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 Academic Deans 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.

In addition to these summative assessments, the Academic Deans meet with the Department Chairs on a weekly basis 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 Academic Deans. 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 Academic Deans to inform the University president 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 Executive Council.

2. **Explain how the institution will evaluate the proposed program's educational effectiveness, including assessments of student learning outcomes, student retention, student and faculty satisfaction, and cost-effectiveness.**

Student Learning Outcomes:

Student learning outcomes for the proposed B.S. in Facilities Management and Critical Infrastructure will be measured using the instruments identified in Section G and Section M as well as the assigned rubrics and assessment measures (e.g., capstone courses, competency exams/projects) dictated by the accreditation requirements of the University's regional accreditor [i.e., Middle States Commission in Higher Education (MSCHE)], our degree specific accrediting organizations (i.e., IACBE, ABET, NSA, DHS), and the Facilities Management Accreditation Commission (FMAC). This program is designed to meet the requirements of MSCHE, IACBE, and FMAC. The program will be reviewed for accreditation by MSCHE, IACBE, and FMAC. The University is in good standing with all its existing accrediting bodies.

Student Retention:

The University maintains a comprehensive student retention program under the Vice President for Student Engagement. The program assesses student retention at all levels, including the individual course, major, and degree. During the semester and term, the University's Drop-Out Detective capability, within its Learning Management System (Canvas), provides an early alert at the course level to potential issues related to retention. Within the Office of Student Life, Academic Advisors monitor Drop-Out Detective and contact students who appear to have issues affecting their academic performance. The Academic Advisors work with each student to create a plan to remove any barriers to success. The Academic Advisors also work with the course instructors as needed to gain additional insight that may be helpful to correcting the situation.

Each student also meets with their Academic Advisor each semester to evaluate their progress toward degree completion. An updated plan of action is developed for each student for their next semester's registration and each succeeding semester through degree completion.

The Vice President for Student Engagement also meets on a regular basis with the Academic Deans to review the student retention within each degree program and address any issues that appear to be impediments to degree completion.

Student and Faculty Satisfaction:

Evaluations and assessment of Student and Faculty satisfaction occur every semester. Faculty members are evaluated every semester by students enrolled in their courses. Students are required to complete a course evaluation online within a specified time frame at the end of the semester for every enrolled course or they are locked out of Canvas (the University's learning management system) until they complete each survey. Every faculty member is also required to review each of their courses for the semester.

The Department Chairs and Academic Deans review the student evaluations for every course offered at the university. The Department Chairs and Academic Deans also review faculty satisfaction every semester. If changes are needed at the course level, the changes are developed and implemented by the faculty responsible for the courses upon approval of the Academic Deans. If changes are needed at the faculty level, the Department Chairs will make

the changes. At the end of this cycle, an evaluation is repeated and the results are analyzed with the appropriate stakeholders regarding the effectiveness of the changes. This is an ongoing process.

Cost Effectiveness:

Based on the year-long inputs, evaluations, and reviews described in Section M from faculty, students, industry representatives, and Department Chairs, the University Academic Dean prepares the proposed academic budget for each program for the upcoming year. Budget increases are tied to intended student learning improvements and key strategic initiatives.

Each academic program is also monitored by the Interim Vice President for Finance and Administration throughout every semester and term for its cost effectiveness. Additionally, the revenue and costs of every university program are reviewed annually by the Executive Council and Board of Trustees prior to approving the next year's budget.

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

1. **Discuss how the proposed program addresses minority student access & success, and the institution's cultural diversity goals and initiatives.**

   Capitol Technology University is a majority/minority school. Our programs attract a diverse set of students who are multiethnic and multicultural. The University actively recruits minority populations for all undergraduate and graduate level degrees. Special attention is also provided to recruit females into the STEM and multidisciplinary programs at all degree levels – undergraduate, Master's, and doctoral. The same attention will be given to the **B.S. in Facilities Management and Critical Infrastructure.**   .

O. Relationship to Low Productivity Programs Identified by the Commission:

1. **If the proposed program is directly related to an identified low productivity program, discuss how the fiscal resources (including faculty, administration, library resources and general operating expenses) may be redistributed to this program.**

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

P. Adequacy of Distance Education Programs (as outlined in COMAR 13B.02.03.22)

1. **Provide affirmation and any appropriate evidence that the institution is eligible to provide Distance Education.**

   Capitol Technology University is fully eligible to provide distance education. The University has a long history of providing high-quality distance education. The University is accredited regionally by the Middle States Commission in Higher Education (MSCHE) and through four specialized accrediting organizations: International Accreditation Council of Business Education (IACBE), Accreditation Board for Engineering and Technology (ABET), NSA, and DHS. All five accrediting organizations have reviewed the University's distance education program as part of their accreditation process. Capitol Technology University is fully accredited by MSCHE,

IACBE, ABET, NSA, and DHS. The University is in good standing with all its accrediting bodies.

2. **Provide assurance and any appropriate evidence that the institution complies with the C-RAC guidelines, particularly as it relates to the proposed program.**

   Capitol Technology University has a long history of providing high quality distance education/online learning that complies with the Council of Regional Accrediting Commissions (C-RAC) Interregional Guidelines for the Evaluation of Distance Education. The University will also continue to comply with the C-RAC guidelines with the proposed **B.S. in Facilities Management and Critical Infrastructure** program.

   a. **Council of Regional Accrediting Commissions (C-RAC) Interregional Guidelines for the Evaluation of Distance Education.**

      1. **Online learning is appropriate to the institution's mission and purposes.**

         Online learning is consistent with the institution's mission, purpose and history. Please refer to Section A of this proposal.

      2. **The institution's plans for developing, sustaining, and, if appropriate, expanding online learning offerings are integrated into its regular planning and evaluation processes.**

         All programs at the University – online, hybrid, and on-ground – are subject to the same regular planning, assessment, and evaluation processes. Please see Section M of this proposal for the detailed process.

      2. **Online learning is incorporated into the institution's systems of governance and academic oversight.**

         All programs at the University – online, hybrid, and on-ground – are subject to the same systems of governance and academic oversight. Please refer to Section G and Section M of this proposal.

      4. **Curricula for the institution's online learning offerings are 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 Academic Deans, Department 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.

5. **The institution evaluates the effectiveness of its online learning offerings, including the extent to which the online learning goals are achieved, and uses the results of its evaluations to enhance the attainment of the goals.**

   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 University Academic 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.

6. **Faculty responsible for delivering the online learning curricula and evaluating the students' success in achieving the online learning goals are appropriately qualified and effectively supported.**

   The Department of Business and Information Sciences, where this degree will be sponsored, is staffed by qualified teaching Department Chair, and other appropriately credentialed faculty.

   The evaluation of new courses and programs is done using the same process as all existing programs (please see Section M of this document). All Capitol Technology University faculty teach in the traditional classroom environment and online. (Please see qualifications in Section I of this document.)

7. **The institution provides effective student and academic services to support students enrolled in online learning offerings.**

   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 Zoom 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.

8. **The institution provides sufficient resources to support and, if appropriate, expand its online learning offerings.**

   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.

9. The institution assures the integrity of its online offerings.

Currently employed faculty act 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 offered, our Human Resource Department initiates a rigorous search and screening process to identify appropriate faculty to design and teach online courses. Again, all faculty are selected on domain experience and program-related teaching experience

The University online platforms offer several avenues to support instructors engaged in online learning. The Director of our Online Learning Division 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 Academic Deans, Department Chairs, and formal meetings.

The assessment for online 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 Academic Deans and Department Chairs. On an annual basis, the information is reported to accreditation authorities such as MSCHE and IACBE.