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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

Payment Submitted: (●) Yes ( ) No	Payment Type: ( ) R*STARS # 99205 (●) Check # 99205	Payment Amount:	Date Submitted: 11/15/25

Department Proposing Program	Engineering	
Degree Level and Degree Type	Bachelor of Science (B.S.)	
Title of Proposed Program	Bachelor of Science in Intelligent Healthcare Systems Engineering	
Total Number of Credits	120	
Suggested Codes	HEGIS: 0999	CIP: 14.9999
Program Modality	(●) On-campus ( ) Distance Education (fully online) ( ) Both	
Program Resources	(●) Using Existing Resources ( ) Requiring New Resources	
Projected Implementation Date (must be 60 days from proposal submisison as per COMAR 13B.02.03.03)	(●) Fall ( ) Spring ( ) Summer	Year: 2026
Provide Link to Most Recent Academic Catalog	URL: http://catalog.captechu.edu	
Preferred Contact for this Proposal	Name: Dr. Mohamed Shehata	
	Title: Dean of Academics	
	Phone: (340) 965-2473	
	Email: mshehata@captechu.edu	
President/Chief Executive	Type Name: Bradford Sims	
	Signature: [signature]	Date: 11-15-25
	Date of Approval/Endorsement by Governing Board: NOV. 15, 2025	

Revised 1/2021

CAPITOL
Technology University

November 15, 2025

Dr. Sanjay Rai
Secretary of Maryland Higher Education
Maryland Higher Education Commission
217 E. Redwood Street, Suite 2100
Baltimore, MD 21202

Dear Dr. Rai,

Capitol Technology University is requesting approval to offer a **Bachelor of Science (B.S.) in Intelligent Healthcare Systems Engineering**. This degree program will be delivered by qualified university faculty and supported through the development of specialized courses designed to meet the growing workforce needs in healthcare systems engineering, digital health integration, artificial intelligence in clinical operations, and health technology infrastructure.

Capitol Technology University's mission is to provide a practical, hands-on education in engineering, technology, and applied sciences—preparing students for professional success and lifelong learning. The proposed B.S. in Intelligent Healthcare Systems Engineering aligns with this mission by equipping students with strong foundations in systems thinking, healthcare operations, data analytics, regulatory compliance, and the design of intelligent health technologies. Graduates will be prepared to contribute immediately to Maryland's healthcare delivery networks, hospital systems, public health initiatives, and digital transformation efforts in health services.

Demand for healthcare systems engineers continues to rise as Maryland and the nation modernize healthcare infrastructure, expand telehealth and digital health platforms, strengthen patient safety systems, and adopt AI-driven tools to improve care delivery. This program is designed to serve students pursuing careers in healthcare systems engineering, clinical informatics, health IT project management, and medical data analytics.

To support this academic initiative, we respectfully submit the full proposal for a **Bachelor of Science in Intelligent Healthcare Systems Engineering** for your review and approval. Enclosed is the required documentation, including the letter confirming the adequacy of library resources to support this new degree program.

Respectfully,

Bradford L. Sims, PhD

President

CAPITOL
Technology University

November 15, 2025

Dr. Sanjay Rai
Secretary of Maryland Higher Education
Maryland Higher Education Commission
217 E. Redwood Street, Suite 2100
Baltimore, MD 21202

Dear Dr. Rai,

This letter is in response to the request for confirmation regarding the adequacy of Capitol Technology University's library resources to support the proposed Bachelor of Science in Intelligent Healthcare Systems Engineering.

As President of the University, I affirm that the Puente Library, including its collections, digital databases, and qualified support staff, is fully equipped to support the instructional and research needs of students and faculty in this interdisciplinary program. Existing holdings include access to key resources in healthcare systems, artificial intelligence, data analytics, engineering design, and project management.

Capitol Technology University remains committed to the ongoing enhancement of its library resources. The institution allocates sufficient funding to ensure that materials are regularly updated and expanded in alignment with program development and evolving industry needs. This commitment ensures that students in the Intelligent Healthcare Systems Engineering program have access to the tools necessary for academic success and professional readiness.

Respectfully,

Bradford L. Sims, PhD

President

99205 VENDOR NO. 17911 DATE 11/12/2025 CHECK NO. 99205

CAPITOL TECHNOLOGY UNIVERSITY

INVOICE NUMBER	INVOICE DATE	DESCRIPTION	GROSS AMOUNT	DISCOUNT/ADJUSTMENTS	PAYMENT AMOUNT
BTSP Program-2	11/11/2025	MHEC BS in Healthcare SystemsEngineering	850.00	0.00	850.00
			850.00	0.00	850.00

ORIGINAL CHECK HAS A COLORED BACKGROUND PRINTED ON CHEMICAL REACTIVE PAPER - SEE BACK FOR DETAILS

CAPITOL Technology University

11301 SPRINGFIELD ROAD, LAUREL, MD 20708
PH: 301-369-2800

FIRST NATIONAL BANK
60-1809/433

99205

DATE 11/12/2025

CHECK AMOUNT
$ *********850.00

PAY EIGHT HUNDRED FIFTY AND NO/100 DOLLARS

TO THE ORDER OF
Maryland Higher Education Commissic
217 E.Redwood Street Suite 2100
Baltimore, MD 21202

CAPITOL TECHNOLOGY UNIVERSITY

⑈099205⑈ ⑆043318092⑆ 030111266⑈

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 2026
Projected Implementation Date

Bachelor of Science
Award to be Offered

Bachelor of Science in Intelligent Healthcare Systems Engineering
Title of Proposed Program

0999
Suggested HEGIS Code

14.9999
Suggested CIP Code

Engineering
Department of Proposed Program

Dr. Mohamed Shehata
Name of Department Head

Dr. Mohamed Shehata
Dean of Academic

mshehata@captechu.edu
Contact E-Mail Address

(240) 965-2473
Contact Phone Number

11-15-25
Signature and Date

President/Chief Executive Approval

NOV. 15, 2025
Date

Date Endorsed/Approved by Governing Board

Bachelor of Science (B.S.)

In

Intelligent Healthcare Systems Engineering (IHSE)
Capitol Technology University
Laurel, Maryland

A. Centrality to mission and planning priorities

1. **Program description and alignment with institutional mission**
   The Bachelor of Science in Intelligent Healthcare Systems Engineering is a 120-credit undergraduate program designed to prepare students to engineer, manage, and optimize complex healthcare systems through the integration of systems engineering principles, healthcare operations, and artificial intelligence. Unlike traditional biomedical engineering programs that focus on biology and medical device design, this program emphasizes the engineering of healthcare delivery systems, data-driven decision-making, and digital transformation technologies.

   Students will gain expertise in control systems, digital health, data analytics, healthcare project management, and AI tools for clinical decision support and systems optimization. The curriculum incorporates a strong foundation in mathematics and physics, an engineering core focused on electronics, systems, and programming, and a specialized healthcare and AI track that includes emerging technologies, policy, and real-world system integration projects. A two-semester capstone design sequence ensures students are able to apply their learning to solve real-world problems in healthcare delivery and health IT systems.

   This program aligns directly with the mission of Capitol Technology University, which is to educate individuals for professional opportunities in engineering, computer and information sciences, and business. The BS in Intelligent Healthcare Systems Engineering supports this mission by offering a workforce-aligned program that equips graduates with in-demand technical knowledge, interdisciplinary systems thinking, and hands-on project experience. Graduates will be well positioned to enter rapidly growing fields such as digital health, clinical systems engineering, and healthcare technology innovation.

   The program also advances Capitol's Strategic Vision 2025 by offering a high-demand, interdisciplinary degree that bridges healthcare and technology, fosters applied and AI-integrated learning environments, and supports enrollment growth through distinctive programming. It prepares students to be leaders in the transformation of modern healthcare systems through engineering innovation, system design, and responsible AI integration.

2. **Explanation of how the proposed program supports the institution's strategic goals and institutional priorities**
   The proposed Bachelor of Science in Intelligent Healthcare Systems Engineering directly supports Capitol Technology University's strategic goals and institutional priorities by introducing a novel engineering degree that responds to urgent workforce needs in healthcare operations, digital health, and AI implementation.

The program contributes to Goal I: Expand Educational Offerings and Increase Program Completion by offering a distinctive degree that appeals to a broad audience, including high school graduates interested in healthcare and technology, as well as transfer students with backgrounds in engineering or health-related fields. The curriculum is designed for flexibility, allowing students to pursue careers in engineering, clinical systems management, or AI-enhanced operations.

It aligns with Goal II: Increase Enrollment and Institutional Awareness by targeting emerging markets in health systems engineering and digital transformation—areas increasingly emphasized in national health policy and infrastructure investment. The program also enables partnerships with regional health systems, consulting firms, and technology providers, positioning Capitol as a leader in applied healthcare engineering education.

The program supports Goal III: Improve the Utilization of University Resources and Institutional Effectiveness by leveraging Capitol's existing faculty, facilities, and instructional strengths in electronics, data science, and systems engineering. Most courses required for the program are already offered under existing programs such as Electrical Engineering, Mechatronics, and Data Science, allowing efficient program launch without significant new resource investment.

The program further supports Goal IV: Increase the Number and Scope of Partnerships through its relevance to hospital systems, health IT companies, consulting firms, and government agencies involved in health innovation. It creates new opportunities for joint research, student internships, and sponsored capstone projects.

Institutional prioritization of the program is evidenced by:

a) The program's development under the leadership of the Dean of Academic Affairs as part of Capitol's strategic response to national trends in healthcare innovation and engineering workforce needs.
b) Internal approval and prioritization at Academic Council and Planning Retreats, with strong support for expanding Capitol's interdisciplinary and AI-integrated program offerings.
c) Program alignment with existing courses, faculty expertise, and research directions in systems engineering, control, robotics, and data analytics.
d) Institutional enrollment goals that emphasize interdisciplinary, market-driven engineering programs, especially those that attract transfer students and professionals with health or tech experience.
e) Strategic positioning to contribute to Capitol's brand as a forward-looking STEM institution with strengths in hands-on, applied learning and emerging industry needs.

3. Description of how the program will be adequately funded for at least the first five years
The Bachelor of Science in Intelligent Healthcare Systems Engineering will be funded through a combination of internal university resources, strategic use of existing instructional capacity, and anticipated tuition revenue as enrollment grows. A full budget plan is included in Section L.

Most courses in the curriculum are already part of Capitol's existing offerings in electrical engineering, computer science, data science, and systems engineering. These courses will be cross-listed or shared, requiring minimal new course development. Specialized healthcare systems courses will be taught by current faculty or supplemented by new adjunct hires, as needed, based on enrollment demand.

Laboratory infrastructure, including access to computing labs, AI software tools (Python, MATLAB, R), and circuit trainers, already exists and supports key elements of the curriculum. As needed, small investments will be made to support healthcare simulation tools or new data sets for capstone and technical courses.

Revenue from tuition and fees will cover instruction, course materials, and program coordination. The university's budget model ensures that the program becomes self-sustaining within three to five years. Targeted enrollment among health IT professionals, transfer students, and high school graduates interested in healthcare and technology will support early growth.

Additionally, Capitol will explore external support such as NSF funding, digital health grants, and partnerships with local healthcare systems to enhance student learning and support curriculum development.

4. **Description of the institution's commitment to the program's long-term success**
   Capitol Technology University is fully committed to the launch and long-term success of the BS in Intelligent Healthcare Systems Engineering.

a) Administrative, financial, and technical support
Administrative oversight will be provided by the Dean of Engineering in coordination with program faculty and support units such as Academic Affairs, Institutional Effectiveness, and IT. The program will be integrated into university operating budgets, and its shared use of existing courses ensures cost-effectiveness. Technical needs, including access to computing environments, healthcare datasets, and laboratory equipment, will be supported by existing infrastructure with incremental updates as needed.

b) Continuation for sufficient time to allow students to complete the program
The university commits to maintaining the program for the full duration needed for students to complete their degrees. In the unlikely event of restructuring, Capitol will implement a formal teach-out plan to ensure enrolled students can graduate with full support. As a regionally accredited institution, Capitol guarantees academic continuity and access to advising and course offerings for all students admitted to 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

a) The need for the advancement and evolution of knowledge
The Bachelor of Science in Intelligent Healthcare Systems Engineering addresses the growing demand for engineering professionals who can integrate systems thinking, data analytics, and artificial intelligence into the design and management of healthcare delivery. Traditional biomedical engineering programs focus heavily on biology and medical devices, but this program reflects the evolution of healthcare as a complex sociotechnical system requiring multidisciplinary, data-informed solutions. By blending engineering principles with digital health, automation, and policy awareness, the program prepares students to lead healthcare innovation and operational transformation in Maryland and beyond. Graduates will contribute to the advancement of knowledge in healthcare systems engineering, a field increasingly critical for managing costs,

improving patient outcomes, and responding to public health challenges through technology-driven solutions.

b) Societal needs, including expanding educational opportunities and choices for minority and educationally disadvantaged students at institutions of higher education
This program is designed to expand access to high-impact STEM education for students who may be underrepresented in engineering or healthcare fields. By offering a curriculum that emphasizes applied learning over biological prerequisites, it opens the door for a broader range of learners, including first-generation college students, adult learners, and community college transfers. Capitol Technology University serves a diverse student population and has a demonstrated commitment to supporting underrepresented minorities in STEM through small class sizes, hands-on projects, individualized advising, and robust academic support systems. This program provides a unique opportunity for students with interests in healthcare and technology to pursue a high-demand career path without the traditional barriers of medical or biology-heavy programs.

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 (HBI), it maintains strong academic partnerships across the state, including with Maryland HBIs. The Intelligent Healthcare Systems Engineering program may serve as a valuable model for collaborative initiatives, articulation agreements, or dual-degree pathways with HBIs seeking to expand offerings in healthcare technology and applied engineering. The program's flexible structure, emphasis on interdisciplinary skills, and focus on health systems innovation align well with statewide efforts to increase access and quality in STEM education for underrepresented populations. Capitol's willingness to engage in inter-institutional collaboration supports the broader goal of expanding high-quality educational programs across Maryland's higher education ecosystem.

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

The Maryland State Plan for Postsecondary Education outlines three overarching goals: (1) Student Access, (2) Student Success, and (3) Innovation. The proposed Bachelor of Science in Intelligent Healthcare Systems Engineering aligns with each of these goals and contributes meaningfully to statewide higher education priorities.

Goal 1: Student Access
"Ensure equitable access to affordable and quality postsecondary education for all Maryland residents."
The program was developed to provide a novel access point for students interested in engineering and healthcare who may not pursue traditional biology-intensive programs. The curriculum is designed to appeal to a wide range of learners, including transfer students from two-year colleges, adult learners, working professionals in healthcare, and underrepresented minorities in engineering. Through articulation agreements, targeted recruitment, and flexible learning pathways, the program supports access for a broader segment of Maryland's population. It aligns with the State Plan's Priority 1 (study of affordability), Priority 2 (financial planning), and Priority 4 (access for specific populations) by lowering entry barriers and promoting pathways to high-wage, high-impact careers.

Goal 2: Student Success
"Promote and implement practices and policies that will ensure student success."
The program emphasizes project-based learning, team collaboration, and real-world system design through its engineering core and healthcare-focused curriculum. A structured two-semester capstone

sequence ensures integration of student learning with applied challenges in healthcare operations. Students receive support through dedicated advising, faculty mentorship, and experiential learning. With built-in exposure to healthcare data, AI tools, and system design challenges, students are prepared for immediate employment or graduate study. These strategies are aligned with Priority 5 (commitment to quality), Priority 6 (improving completion systems), and Priority 7 (lifelong learning) in the State Plan.

Goal 3: Innovation
"Foster innovation in all aspects of Maryland higher education to improve access and student success."
The Intelligent Healthcare Systems Engineering program embodies innovation in both content and delivery. It integrates emerging technologies such as artificial intelligence, digital health, and systems modeling into a coherent curriculum that addresses real-world challenges. The program is among the first in the state to explicitly focus on the engineering of healthcare systems rather than biology or medicine. It leverages existing instructional infrastructure while enabling flexible expansion into new technical areas through technical electives and industry partnerships. This approach supports Priority 8 (pedagogical innovation), Priority 9 (expansion of academic practices), and Priority 10 (integration of work-based learning) by equipping students with both theoretical understanding and practical, hands-on experience in a rapidly evolving field.

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

1. **Describe potential industry or industries, employment opportunities, and expected level of entry for graduates of the proposed program**
   Graduates of the Bachelor of Science in Intelligent Healthcare Systems Engineering will be prepared for a wide range of roles at the intersection of healthcare, engineering, and digital technology. The program is designed to meet the increasing demand for systems-oriented professionals in clinical engineering, healthcare operations, and health information technology. Graduates will be well-positioned to work in hospitals, healthcare systems, health IT companies, consulting firms, insurance and policy organizations, and government health agencies.

   Expected employment opportunities include roles such as healthcare systems engineer, digital health analyst, clinical engineering manager, health informatics engineer, healthcare AI specialist, quality and risk management engineer, and smart hospital systems designer. These positions generally require a bachelor’s degree and emphasize knowledge of systems design, healthcare operations, automation, data analytics, and AI tools.

   Graduates will typically enter at the junior engineer, analyst, or systems integrator level, but their interdisciplinary training and exposure to real-world projects will allow for rapid advancement into supervisory and project leadership roles. With further experience or graduate education, graduates will be qualified for strategic positions in healthcare technology integration, digital transformation leadership, and innovation management in health systems.

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

National and state labor data show strong and growing demand for professionals with interdisciplinary skills in healthcare engineering, systems optimization, and digital health technology.

According to the U.S. Bureau of Labor Statistics (BLS), employment in healthcare occupations is projected to grow 13 percent between 2023 and 2033, adding approximately 2 million new jobs nationwide. Within this broad category, roles involving healthcare information systems, systems integration, and medical technology support are seeing increased demand due to the continued expansion of digital health infrastructure and data-driven care models.

Occupations closely aligned with the program's focus include:

- Medical and health services managers, projected to grow 28 percent from 2023 to 2033, with a median annual wage of $110,680
- Health informatics specialists, with high demand driven by electronic health record (EHR) systems, predictive analytics, and data governance
- Industrial engineers and systems engineers working in healthcare settings, earning median wages over $100,000 and expected to grow 12 percent over the next decade
- Clinical and biomedical engineers, particularly in hospitals and medical device firms, with steady growth supported by increased reliance on AI and automation in care delivery

In Maryland specifically, health and life sciences continue to be one of the state's largest and fastest-growing economic sectors. The Maryland Department of Labor projects over 20 percent growth in roles related to healthcare technology management and medical systems integration between 2022 and 2032. Major employers such as Johns Hopkins Medicine, MedStar Health, University of Maryland Medical System, and GE HealthCare are investing in digital transformation and require engineers who can lead automation, interoperability, and smart system initiatives.

Maryland's growing footprint in health IT, public health infrastructure, and healthcare consulting supports the long-term market demand for graduates of the Intelligent Healthcare Systems Engineering program. Employers in the state are increasingly seeking engineering graduates who understand the complexity of healthcare delivery systems and can apply data analytics, systems design, and emerging technologies to optimize performance, safety, and patient outcomes.

3. **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**
The Georgetown University Center on Education and the Workforce projects that more than 70 percent of jobs in Maryland by 2031 will require postsecondary education, with substantial demand in healthcare and applied technology. Their research identifies a growing skills gap in middle-to-high skill technical occupations—particularly those that require expertise in both data analysis and systems integration within regulated industries such as healthcare.

The Maryland Statewide Workforce Development Plan (2024–2028) identifies healthcare systems innovation, data-informed decision-making, and automation in health services as key areas for strategic workforce development. The report emphasizes that Maryland's future healthcare workforce must include engineers trained in digital infrastructure, interoperability, system modeling, and predictive tools. It also notes that training pipelines must evolve to support interdisciplinary roles that cannot be filled by traditional biomedical or IT-only programs.

Additional market evidence is provided by job posting analytics from platforms such as Lightcast and LinkedIn, which show high employer demand in Maryland for roles such as:

- Healthcare data analyst
- Systems integration engineer – healthcare
- Clinical informatics engineer
- AI and automation engineer – health systems
- Digital transformation project manager

These roles consistently appear in listings from major hospital systems, consulting firms, and federal agencies including the Department of Veterans Affairs and the Centers for Medicare & Medicaid Services (CMS), which are expanding their digital infrastructure. The consistent appearance of these positions in job postings underscores the market demand for graduates with a systems engineering background specifically tailored to the healthcare sector.

4. **Provide data showing the current and projected supply of prospective graduates**

Currently, very few academic programs in Maryland focus specifically on healthcare systems engineering at the undergraduate level. Traditional biomedical engineering programs are available at institutions such as Johns Hopkins University and the University of Maryland, but these are generally biology-focused and do not emphasize systems engineering, digital health, or AI integration.

According to the U.S. Department of Education's Integrated Postsecondary Education Data System (IPEDS), Maryland institutions awarded approximately:

- 250 bachelor's degrees in biomedical engineering
- 180 bachelor's degrees in health informatics or related data analytics fields
- 0 bachelor's degrees in healthcare systems engineering

This indicates a clear gap in undergraduate offerings that integrate engineering, data science, and healthcare systems.

The proposed Bachelor of Science in Intelligent Healthcare Systems Engineering fills this unmet need by providing a structured pathway into a growing profession that bridges healthcare operations, digital transformation, and technical systems design. It will be the first undergraduate program in Maryland explicitly focused on healthcare systems engineering with AI integration.

Based on institutional planning:

- The program is expected to enroll 15 students in its first year
- Enrollment is projected to reach 60–80 students by year five
- Graduation is projected to average 10–15 students per year by year five, assuming standard progression and retention rates

These graduates will contribute directly to filling high-need roles in Maryland's healthcare, public health, and health technology workforce. Their unique combination of systems thinking, technical engineering training, and healthcare domain knowledge positions them to respond to some of the state's most pressing health infrastructure and innovation needs.

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.**
   While several institutions in Maryland offer undergraduate programs in biomedical engineering, health informatics, and systems-related disciplines, there are currently no undergraduate programs that offer the same integration of healthcare systems engineering, artificial intelligence, and applied systems design as the proposed Bachelor of Science in Intelligent Healthcare Systems Engineering.

   Some related programs in the state include:

   University of Maryland Eastern Shore offers a Bachelor of Science in Biomedical Engineering. While this program is healthcare-related and engineering-based, it focuses primarily on biology, biomechanics, biomaterials, and medical devices. It does not include the systems engineering, automation, or AI integration central to the proposed program.

   Capitol Technology University currently offers a Bachelor of Science in Healthcare Administration and Systems Security. This program emphasizes management, systems security, and health information technology, but it is not an engineering program and does not meet the curricular standards associated with ABET-accredited engineering degrees.

   Morgan State University offers Bachelor of Science programs in Industrial and Systems Engineering and Electrical Engineering. These programs include relevant engineering concepts but are not healthcare-specific and do not integrate digital health, AI, or healthcare systems modeling.

   University of Maryland, College Park offers a Bachelor of Science in Bioengineering. This is a research-focused program that emphasizes biological and molecular systems, requiring a strong foundation in life sciences and offering less accessibility to nontraditional students. It does not address healthcare delivery systems or the application of AI in clinical operations.

   The proposed Bachelor of Science in Intelligent Healthcare Systems Engineering is unique in that it combines systems engineering, healthcare operations, and AI into a single, interdisciplinary curriculum. It emphasizes real-world applications such as healthcare automation, smart hospital systems, and data-driven healthcare design. The program is specifically designed to be accessible to students from diverse academic backgrounds, including those without heavy biology preparation, and to serve the growing need for engineering professionals in healthcare transformation. No other undergraduate program in Maryland provides this breadth or focus.

2. **Provide justification for the proposed program**
   The proposed program is justified by a combination of market demand, academic distinctiveness, and institutional alignment:

   a. Maryland and the broader Mid-Atlantic region are experiencing rapid growth in digital health, clinical systems engineering, and healthcare technology management. Employers report challenges in finding engineers who understand both healthcare operations and modern technologies such as AI, automation, and data analytics.

b. Existing academic programs either focus on biology-heavy biomedical engineering or health administration, leaving a critical gap in engineering education that addresses complex healthcare systems from a design and optimization perspective. The proposed program fills this gap by blending systems engineering, healthcare process modeling, and intelligent technologies.
c. The program is designed to serve a broad and diverse student population, including transfer students, adult learners, and those seeking direct entry into the healthcare technology workforce. Its interdisciplinary nature, hands-on learning approach, and integration of real-world data make it both practical and scalable.
d. Capitol Technology University's mission is to educate individuals for professional opportunities in engineering, technology, and applied sciences. The Intelligent Healthcare Systems Engineering program directly supports this mission by preparing graduates for leadership in one of the fastest-growing and most critical sectors of the U.S. economy—healthcare delivery and innovation.

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 proposed Bachelor of Science in Applied Engineering is designed to complement, not disrupt, high-demand programs currently offered by Maryland's Historically Black Institutions (HBIs). Institutions such as Morgan State University and the University of Maryland Eastern Shore offer established engineering and engineering technology programs that serve critical roles in preparing underrepresented students for success in STEM careers. These programs are essential to Maryland's workforce development and educational equity goals and should be preserved and strengthened.

The Applied Engineering program differs in its curricular design and student focus. It emphasizes interdisciplinary, hands-on, and systems-level engineering education that blends electrical, mechanical, and computing components into a single, practice-oriented degree. The program also targets a different demographic—particularly adult learners, community college transfer students, and working professionals—many of whom may not pursue traditional engineering pathways offered at HBIs.

Rather than drawing students away from HBI programs, the Applied Engineering program may support them in several ways:

- By creating additional transfer opportunities for HBI students in general studies or pre-engineering tracks who may prefer an applied, workforce-oriented degree.
- By opening the door to inter-institutional collaboration on design projects, applied research, and workforce initiatives, particularly in automation, smart systems, and manufacturing.
- By expanding Maryland's overall capacity to meet **statewide employer demand** for graduates with applied engineering skills without duplicating the theoretical or discipline-specific focus of HBI engineering programs.

The introduction of this program will not reduce enrollment or diminish support for high-demand HBI programs. Instead, it addresses workforce needs through a complementary model of engineering

education that preserves institutional missions while increasing access and responsiveness across the state.

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 proposed Bachelor of Science in Intelligent Healthcare Systems Engineering is not expected to negatively impact the uniqueness, institutional missions, or enrollment priorities of Maryland's Historically Black Institutions (HBIs). On the contrary, it supports the state's broader objective of increasing access to high-quality, workforce-aligned STEM programs and complements the educational missions of HBIs by advancing opportunities in emerging interdisciplinary fields.

   Maryland's HBIs—including Morgan State University, Bowie State University, Coppin State University, and the University of Maryland Eastern Shore—serve a vital role in expanding representation and educational attainment among African American students. Their missions emphasize leadership, social justice, academic excellence, and the preparation of students for high-demand careers in science, technology, engineering, and healthcare.

   The proposed program differs meaningfully from existing HBI offerings. While some HBIs offer biomedical engineering, industrial and systems engineering, or health-related degrees, none currently provide an undergraduate program that integrates healthcare delivery systems, engineering design, and artificial intelligence into a unified curriculum. The Intelligent Healthcare Systems Engineering program emphasizes systems thinking, automation, data-driven healthcare design, and hands-on project-based learning. It is designed to be accessible to transfer students, adult learners, and students seeking interdisciplinary training for careers in healthcare technology, hospital systems engineering, or digital health transformation.

   Rather than duplicating HBI programs, the proposed degree fills a curricular gap and may serve as a complementary program that creates new avenues for inter-institutional collaboration. Capitol Technology University welcomes the opportunity to develop articulation agreements or joint initiatives with HBIs to expand educational pathways for underrepresented students interested in healthcare innovation and intelligent systems.

   By offering a flexible, forward-looking program in an area of high workforce demand, the Intelligent Healthcare Systems Engineering degree supports Maryland's strategic goals related to STEM education equity and innovation. The program respects and complements the identities of HBIs while advancing shared statewide goals of inclusion, access, and workforce readiness in the healthcare engineering domain.

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

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

The Bachelor of Science in Intelligent Healthcare Systems Engineering was developed through a collaborative process involving faculty from Capitol Technology University's School of Engineering, School of Computer and Data Science, and academic leadership from the Office of Academic Affairs. The program design was guided by input from healthcare industry professionals, engineering faculty, and advisory board members who identified a growing need for systems-focused engineers capable of supporting digital transformation in healthcare delivery.

The program builds upon Capitol's institutional strengths in systems engineering, electronics, and data analytics, and incorporates courses already offered in electrical engineering, computer science, and robotics. New courses were designed to cover healthcare systems modeling, AI applications, digital health infrastructure, and systems integration. The program is intended to meet EAC-ABET expectations and prepare students for professional roles in clinical systems design, automation, and healthcare AI.

The program will be overseen by full-time faculty with expertise in systems engineering, data science, and healthcare applications. Faculty involved in the program hold doctoral degrees in engineering, computer science, or closely related fields, and bring experience in both academia and industry. Adjunct faculty with specialized experience in healthcare technology, informatics, or AI may be engaged to teach select courses and mentor senior design projects.

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

The program will be delivered primarily in a face-to-face format on campus, with select courses available in hybrid or online formats to accommodate transfer students and working professionals. The curriculum is project-based and includes real-world datasets, simulation activities, and system design assignments using tools such as MATLAB, Python, and healthcare analytics platforms.

Educational Objectives: Graduates of the Intelligent Healthcare Systems Engineering program will:

1. Be prepared for entry-level employment in roles such as healthcare systems engineer, clinical informatics analyst, or digital health technologist.
2. Apply engineering principles, systems thinking, and AI tools to the design and optimization of healthcare processes and delivery systems.
3. Demonstrate ethical responsibility, teamwork, and leadership in multidisciplinary healthcare environments.
4. Pursue professional certification, graduate study, or continuing education in healthcare engineering, digital health, or AI systems.

Learning Outcomes: Upon graduation, students will be able to:

1. Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. Apply engineering design to healthcare systems and technologies that meet specified needs, considering safety, sustainability, public health, and economic factors.
3. Communicate effectively with stakeholders across technical, clinical, and administrative domains.
4. Recognize ethical and professional responsibilities in healthcare systems engineering and make informed decisions considering societal and patient impacts.
5. Function effectively on interdisciplinary teams to lead, collaborate, and meet system design goals.

6. Develop and conduct appropriate experimentation, analyze healthcare data, and use engineering judgment to evaluate system performance.
7. Acquire and apply new knowledge as needed to adapt to evolving technologies, practices, and regulatory environments in healthcare.

These outcomes align with ABET Student Outcomes 1–7 and reflect the program's academic rigor, technical breadth, and real-world applicability in the healthcare engineering sector.

3. **Explain how the institution will:**

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

Student learning outcomes will be assessed through direct and indirect methods across all required courses. Each course includes defined outcomes mapped to the program-level learning outcomes and ABET criteria. Faculty will use exams, labs, system design projects, and technical reports to evaluate student performance. The two-semester capstone project will serve as the culminating experience, allowing students to demonstrate integrative learning and systems-level problem-solving in healthcare contexts.

Assessment results will be compiled into annual reports reviewed by the program chair and submitted to the Office of Academic Affairs. Feedback from the program's advisory board will be used to ensure ongoing relevance to industry and support curricular improvements.

b) Document student achievement of learning outcomes in the program

Capitol Technology University maintains an institution-wide assessment management system to support documentation of course- and program-level learning outcomes. Faculty will archive assessment tools, student artifacts, and evaluation rubrics for each course. Capstone design outcomes and senior presentations will be documented and reviewed as part of annual program evaluation. Data from these sources will be incorporated into continuous improvement plans and formal self-study reports for internal review and external accreditation, including ABET.

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

The Bachelor of Science in Intelligent Healthcare Systems Engineering is a 120-credit interdisciplinary degree that prepares students to engineer, manage, and optimize healthcare delivery systems through the application of engineering design, systems modeling, data analytics, and AI tools. The curriculum integrates electrical and systems engineering with healthcare operations, policy, and digital transformation, with a strong emphasis on project-based learning and real-world data.

The Bachelor of Science in Intelligent Healthcare Systems Engineering consists of 120 semester credit hours distributed across five major curricular categories, as shown below:

Category	Description	Distribution (Credits)
General Education	Communication, ethics, humanities, and business fundamentals	21
Mathematics & Science	Algebra, calculus, statistics, physics, chemistry, and anatomy	31
Engineering & CS Core	Foundational courses in circuits, electronics, AI, programming, etc.	36
Healthcare Systems & AI Core	Systems engineering applied to healthcare, with technical electives	27
Capstone Design	Two-semester senior project focused on intelligent healthcare systems	6
Total		**120**

Curriculum Structure (120 Credits)

Category	Course Number	Course Title	Credits
General Education (21 Cr)	EN 101	English Composition I	3
	EN 102	English Composition II	3
	HU 331	Arts and Ideas	3
	SS 351	Ethics	3
	HU/SS Elective	Humanities or Social Science Elective	3
	BUS 174	Introduction to Business and Management	3
	BUS 301	Project Management	3
Mathematics & Science (31 Cr)	MA 114	Algebra and Trigonometry	4
	MA 261	Calculus I	4
	MA 262	Calculus II	4
	MA 128	Introduction to Statistics	3
	PH 201	General Physics I	3
	PH 202	General Physics II	3
	CH 120	Chemistry	3
	BIO 120	Human Anatomy & Physiology	3
Eng. & CS Core (36 Cr)	EL 100	Introduction to DC/AC Circuits	3
	EL 150	DC/AC Circuits and Analysis	3
	EL 200	Electronic Devices & Circuits	3
	MEC 370	Electronics and Instrumentation	3
	EE 406	Signals and Systems	3
	CS 120	Intro to Programming Using Python	3
	NT 150	Computer Networking	3
	AIT 201	Introduction to Artificial Intelligence	3
	CS 220	Database Management	3
	DS 235	Introduction to Data Mining	3
	IAE 201	Intro to Information Assurance Concepts	3
Healthcare Sys & AI Core (27 Cr)	HCE 200	Foundations of Healthcare Systems Engineering	3
	HCE 310	Healthcare Project Planning & Management	3
	HCE 340	Emerging Technologies in Healthcare Systems	3
	HCE 350	AI and Data Analytics in Healthcare	3
	HCE 410	Concept Development in Healthcare Engineering	3
	HCE 420	System Design & Integration in Healthcare	3
	HCE 430	Validation and Testing of Healthcare Systems	3

	HCE 440	Health Systems Structure and Policy	3
	HCE ***	Elective 1	3
	HCE ***	Elective 2	3
	HCE ***	Elective 3	3
Capstone Design (6 Cr)	SDE 457	Senior Design Project I	3
	SDE 458	Senior Design Project II	3
		Total Credits	**120**

Courses Descriptions

General Education (21 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 4 essays/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. Prerequisite(s): 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(s): EN 101**2.**

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(s): 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(s): EN 102

Humanities or Social Science Electives (3 credits): This elective allows students to broaden their educational experience by exploring topics beyond the technical disciplines of engineering. Students may choose from a range of approved courses in areas such as history, philosophy, sociology, psychology, economics, or cultural studies. This flexibility encourages intellectual exploration, enhances critical thinking, and promotes a deeper understanding of human behavior, societal structures, and cultural contexts. Such knowledge supports the development of well-rounded engineering professionals who are capable of making informed, ethical, and socially responsible decisions in their professional practice.

BUS 174 - Introduction to Business and Management (3 credits): This course presents a survey of the general business and management environment. Topics include an introduction to the various forms of business, organizational structure, and their legal implications. Modern management and supervision concepts, history and development of theory and practice, the roles of managers, and the relationship between manager and employee are examined. This is a seminar course with emphasis on class discussion and collaborative learning.

BUS 301 - Project Management (3 credits): This course is an introduction to project management. It covers the origins, philosophy, methodology, and involves actual applications and use of tools such as MS Project. The System Development Cycle is used as a framework to discuss project management in a variety of situations. Illustrative cases are used and project leadership and team building are covered as integral aspects of good project management. Prerequisite(s): BUS 101 or BUS 174

Mathematics and Science (27 Credits)

MA 114 - Algebra and Trigonometry (4 credits): Designed for students needing mathematical skills and concepts for MA-261. Topics in this course are as follows. Algebra: basic operations on real and complex numbers, fractions, exponents and radicals. Determinates: Solution of linear, fractional, quadratic and system equations. Trigonometry: definition and identities, angular measurements, solving triangles, vectors, graphs and logarithms. Prerequisite(s): MA 112 or placement test score.

MA 261 - Calculus I (4 credits): This course covers lines, circles, ellipses; functions and limits, differentiation, power rule, higher-order derivatives, product, quotient and chain rules, implicit differentiation, and applications. Regarding integration, it addresses definite integrals; indeterminate forms; exponential, logarithmic, trigonometric and hyperbolic functions; differentiation and integration, and graphing. Prerequisite(s): MA 114

MA 262 - Calculus II (4 credits): This course centers on methods of integration, including completing the square, substitution, partial fractions, integration by parts, trigonometric integrals, power series, and parametric equations. It also addresses partial derivatives, directional derivatives, and an introduction to multiple integrals. Prerequisite(s): MA 261

MA 128 - Introduction to Statistics (3 credits): This course addresses probability: definitions, theorems, permutations and combinations; binomial, hypergeometric, Poisson and normal distributions; sampling distribution and central limit theorem; and estimation and hypothesis testing. Prerequisite(s): MA 110, MA 111 or MA 112

PH 201 - General Physics I (3 credits): This is a non-calculus-based physics course intended for credit in engineering technology courses. PH-261 is to be used for electrical, computer, and software engineering courses. PH-201 addresses mechanics, focusing on 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, and impulse and momentum. It also addresses heat, focusing on temperature scales, thermal properties of matter, heat and temperature change, heat and change of phase, physics of heat transfer, and applications. Students completing this course may not enroll in PH-261 for additional credit. Prerequisite(s): MA 114

PH 202 - General Physics II (3 credits): Non-calculus based physics intended for credit in engineering technology courses. Use PH-262 for electrical, computer and software engineering courses. Light and

sound: wave motion, nature of light, reflection and mirrors, refraction, prisms, dispersion lenses; simple harmonic motion; sound transmission, resonance, interference. Doppler Effect. Electricity and magnetism: Static electricity, electric fields, magnetic fields, electric potential, capacitance; electricity in motion; magnetic induction; electromagnetic relations. Alternating currents. Prerequisite(s): PH 201

CH 120 – Chemistry (3credits): This courses teaches metric system and significant figures, stoichiometry, fundamental concepts of atomic structure and its relationship to the periodic table and electron configuration. Bonds and electronegativity, gases, oxidation states and redox, solutions, acids and bases, changes of state, thermodynamics, and chemical kinetics and equilibrium are also included. Prerequisite(s): MA 112 or MA 114

BIO 120 – Human Anatomy & Physiology (3 credits): Introduces the structure and function of the human body, emphasizing major organ systems and physiological processes. Topics include cellular structure, tissues, the musculoskeletal, nervous, cardiovascular, respiratory, digestive, urinary, and reproductive systems, along with basic concepts in homeostasis and pathology. Designed to provide foundational biological knowledge for students in healthcare systems and engineering programs. **Prerequisite(s):** None.

Engineering and Computer Science Core (36 Credits)

EL 100 – Introduction to DC/AC Circuits (3 credits): Basic electrical concepts and laboratory techniques. Current, voltage, resistance and power. Ohm's law, series and parallel resistive circuits. Kirchhoff's voltage and current laws. Loading effects on meters and supplies. Capacitors and Inductors. Charging and discharging. RC and RL time constants. Introduction to AC. Sinusoidal waveforms, phasors and use of the J operator. Reactance and admittance. Average values and RMS. Laboratory emphasis is on the proper use of standard meters, testing equipment and circuit breadboarding. MATLAB Part I: Introduction to MATLAB, variables, MATLAB functions, data types, writing a MATLAB program, using basic plotting functions. Corequisite(s): MA 112.

EL 150 – DC/AC Circuits and Analysis (3 credits): Applications of Kirchhoff laws to multiple source and complex series-parallel circuits. Determinants and matrices. Mesh and nodal analysis. Network Theorems: Thevenin, Norton, superposition, maximum power transfer. Review of complex number manipulation. Application to capacitive and inductive circuits, impedance. Complex Mesh analysis. Network theorems applied to complex RLC networks. Frequency response of RL and RC circuits. Plotting frequency response. Bode plots. Laboratory emphasis on the use of standard test equipment to verify theory. MATLAB Part II: input and output statements, importing data from spreadsheets, text files and other formats into MATLAB, conditional statements, loops, arrays, array functions. Prerequisite(s): EL 100. Corequisite(s): Math (MA 114 or MA 114 Placement Test equivalent or MA 261 or MA 261 Placement Test equivalent)..

EL-200 – Electronic Devices/Circuits (3 credits): Principles and characteristics of semiconductor devices. Devices covered include diodes, Zener diodes, bipolar junction transistors, field-effect transistors, and operational amplifiers. Includes bias networks, operating points, maximum output and optimum bias, and DC and AC load lines. Input and output impedances, and voltage and current gains for each amplifier configuration. Prerequisite(s): EL 150.

MEC 370 - Electronics and Instrumentation (3 credits): This course provides a comprehensive study of sensors and signal conditioning systems with a focus on applications in mechatronics and robotics. It covers the design and analysis of sensor-based input mechanisms, signal processing, and instrumentation techniques essential for modern engineering systems. Topics include sensor technologies, analog and digital signal conditioning, operational and instrumentation amplifiers, sensor interfacing, error analysis, and measurement system architecture. Emphasis is placed on integrating sensor data into mechatronic and robotic systems, with a strong focus on project-based lab work where students apply concepts in real-time control systems, preparing them for practical, real-world applications. Prerequisite(s): EL 200

EE 406 - Signals and Systems (3 credits): Mathematical models, systems, signal classifications, I/O differential and difference equations, block diagram realizations, discrete-time systems. Convolutions: discrete-time and continuous-time. The Z-transform in linear discrete-time systems, transfer functions. Trigonometric Fourier series, polar and rectangular forms, odd/even functions, response of a linear system to periodic input. Fourier transform, symmetry properties, transform theorems, linear filtering, modulation theorem. Laplace and Fourier transforms and their properties. Offered during fall semester only. Offered during fall semester only. Prerequisite(s): MA 262 and MA 340

CS 120 - Introduction to Programming Using Python (3 credits): The course will cover basic concepts and elements of computer programming using Python. Topics include variables, constants, operators, expressions, statements, branching, loops, and functions. Additionally, Python specific data structures, built-in functions, library modules and working with external files will be applied in developing working code.

NT 150 - Computer Networking (3 credits): This course is a continuation of NT-100 with major emphasis on local network equipment, network software and addressing schemes. Students build, configure, test and troubleshoot a network in the laboratory. Routers and switches are included. This material can be used as a basis for studying for CISCO's ICND1.

AIT 201 - Introduction to Artificial Intelligence (3 credits): Introduction to Artificial Intelligence explores the foundational principles and applications of AI. Students delve into key concepts such as machine learning, data representation, and problemsolving algorithms. The course introduces ethical considerations in AI development and its societal impact. Exploring various types of AI, from rule-based systems to machine learning approaches, students gain insights into the breadth of AI applications. Hands-on projects provide practical experience in implementing AI techniques. This course equips students with a broad understanding of AI's capabilities and challenges, laying the groundwork for advanced studies and real-world applications. Prerequisite(s): MA 128

CS 220 - Database Management (3 credits): An overview of database systems, with an emphasis on relational databases. Terminology, basic analysis and design using Entity-Relationship diagrams and relational schemas. Database implementation, queries and updates in a modern relational database management system. An overview of database administration, transactions and concurrency. Data warehouses. Projects, which are assigned as homework, are implemented in Oracle. Prerequisite(s): CS 120 or CS 130 or CS 150. You may take this course and CS-130 concurrently.

DS 235 - Introduction to Data Mining (3 credits): This course will introduce basic concepts of data mining including data exploration, preparation, supervised and unsupervised learning algorithms, model evaluation and deployment. Students will learn to utilize one or more tools used in data mining to apply their learned data mining techniques to such problems as predictive modeling. Prerequisite(s): CS 120 or CT 206

IAE 201 - Introduction to Information Assurance 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. Classes are a mixture of lecture, current event discussions, and laboratory exercises. NOTE: Students enrolled in this course incur an additional lab fee of $100. Prerequisite(s): MA 110 or MA 112 or MA 114 or MA 261

Healthcare Systems & AI Core (30 Credits)

HCE 200 – Foundations of Healthcare Systems Engineering (3 credits): Introduces systems engineering principles applied to healthcare delivery and technology management. Topics include the healthcare systems life cycle, requirements analysis, process modeling, design trade-offs, and risk assessment. Case studies explore how engineering supports patient safety, efficiency, and care quality. Prerequisite(s): EL 100 or permission of the instructor.

HCE 310 – Healthcare Project Planning and Management (3 credits): Covers project planning, scheduling, budgeting, and control for healthcare systems. Students use tools such as WBS, EVM, and CPN while developing leadership and stakeholder communication skills. A simulation project spans the full healthcare project life cycle. Prerequisite(s): HCE 200 or concurrent enrollment.

HCE 340 – Emerging Technologies in Healthcare Systems (3 credits): Explores emerging healthcare technologies including telemedicine, wearable sensors, and predictive analytics. Emphasizes systems integration, ethical considerations, interoperability, and regulatory impacts. Team-based projects analyze real-world applications. Prerequisite(s): HCE 200 or junior standing.

HCE 350 – Artificial Intelligence and Data Analytics in Healthcare (3 credits):
Applies AI, machine learning, and data analytics to healthcare problems. Topics include data preparation, model selection, validation, and visualization. Students complete a hands-on project using healthcare datasets. Prerequisite(s): MA 128 or DS 235, and HCE 200.

HCE 410 – Concept Development in Healthcare Engineering (3 credits): Focuses on early-phase healthcare system design. Students perform needs analysis, define operational scenarios, and assess risks and trade-offs. Teams produce concept proposals and present system-level solutions. Prerequisite(s): HCE 310 and senior standing, or permission of the instructor.

HCE 420 – System Design and Integration in Healthcare (3 credits): Examines detailed design and integration using Model-Based Systems Engineering. Topics include SysML modeling, human-system integration, and reliability. Students develop a comprehensive healthcare system design project. Prerequisite(s): HCE 410.

HCE 430 – Validation and Testing of Healthcare Systems (3 credits): Covers test and evaluation methods for verifying healthcare systems and technologies. Includes hardware, software, and user-interface testing, as well as compliance with FDA, ISO, and other standards. Prerequisite(s): HCE 420.

HCE 440 – Health Systems Structure and Policy (3 credits): Provides an overview of U.S. healthcare delivery, reimbursement, and regulation. Students explore how systems engineering and policy intersect to

improve outcomes. Comparative global models are also discussed. Prerequisite(s): EN 102 or junior standing.

Sample Technical Electives (9 credits total): Students select three elective courses from an approved list to deepen their expertise in emerging and applied areas related to healthcare systems, artificial intelligence, robotics, and data science. These electives allow for tailored learning aligned with career interests or project goals. Topics include foundational AI principles, predictive modeling, robotics integration, digital health infrastructure, telemedicine, logistics systems, and signal processing. Electives support advanced skill development in intelligent system design, data-driven healthcare solutions, and interdisciplinary problem-solving.

Capstone Design Sequence (6 Credits)

SDE 457 - Senior Design I (3 credits): Students/teams select a project, develop an understanding of the project scope that includes research and documentation of related work, prepare a feasibility study, develop project requirements (constraints) and engineering, software, and/or security specifications, propose solutions and multiple designs, analyze proposed designs, select a final proposed design, and prepare and present a preliminary design review (PDR). Students are expected to apply proper systems engineering and project management to their work. Additional components may be required in some projects. Students/teams submit a final report at the end of the semester. Prerequisite(s): Senior standing.

SDE 458 - Senior Design II (3 credits): Students/teams build and test their selected designs (completed in SDE 457). Each student team delivers a tested prototype and defends its project in front of a panel of experts. Students/teams submit a final report that includes description of the design, realization, and test processes as well as test results, discussion, and conclusion. Failure to deliver a completed design and a working prototype that meets engineering, software, and/or security specifications by the end of the semester may result in failing the course. Prerequisite(s): SDE 457

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

The Bachelor of Science in Intelligent Healthcare Systems Engineering fully satisfies the general education requirements established by the Maryland Higher Education Commission (MHEC) and the standards outlined in COMAR 13B.02.03. The curriculum includes 21 credits of general education coursework designed to promote critical thinking, effective communication, ethical reasoning, and a broad understanding of societal and professional contexts.

The general education component includes English composition (EN 101 and EN 102), humanities (HU 331 – Arts and Ideas), social and behavioral sciences (BUS 174 and SS 351), and a general elective in the humanities or social sciences. These courses ensure that students develop written and oral communication skills, ethical judgment, and cultural literacy. Quantitative reasoning and scientific literacy are addressed through 27 credits of required coursework in algebra, calculus, statistics, differential equations, and physics, all of which meet the natural science and mathematics components of general education.

This structure ensures that graduates possess not only technical and professional expertise but also the intellectual foundation necessary to function effectively as ethical and engaged professionals in the healthcare technology field.

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

Capitol Technology University intends to seek accreditation for the Bachelor of Science in Intelligent Healthcare Systems Engineering from the Engineering Accreditation Commission (EAC) of ABET, in accordance with the university's accreditation strategy for all engineering programs. The curriculum is designed to meet the ABET General Criteria for Baccalaureate-Level Programs, particularly Criterion 5: Curriculum, and the Program Criteria for General Engineering or similarly titled interdisciplinary programs.

a) General Criteria – Curriculum Requirements

The curriculum includes:

- A full year of college-level mathematics and basic sciences, including algebra, calculus, differential equations, statistics, and calculus-based physics (MA 114, MA 261, MA 262, MA 340, MA 345, PH 201, PH 202)
- At least one and one-half years of engineering topics, including courses in circuits, digital electronics, control systems, healthcare system modeling, project planning, systems integration, and senior design
- A major design experience (HCE 457 and HCE 458) based on knowledge and skills acquired in earlier coursework and focused on solving a healthcare systems engineering problem

b) Program Criteria – Intelligent Healthcare Systems Engineering

As an interdisciplinary engineering program, the degree will be reviewed under program criteria applicable to systems-based or general engineering programs. The curriculum emphasizes:

- Engineering problem-solving and design applied to healthcare operations and digital transformation
- Integration of healthcare policy, project planning, and safety in engineered systems
- Application of data analytics and artificial intelligence in system modeling and decision-making
- Design projects and lab experiences that reflect real-world constraints and patient safety considerations

Accreditation will be pursued following the graduation of the program's first cohort. Once accredited, graduates will be eligible to pursue professional licensure in states recognizing ABET-accredited degrees and will be competitive for graduate study and advanced certification in systems engineering, healthcare technology, and data science.

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

This program does not involve any contractual agreements with other institutions or non-collegiate organizations. All instruction, curriculum development, academic oversight, and student support services for the Bachelor of Science in Intelligent Healthcare Systems Engineering will be provided exclusively by Capitol Technology University using its existing faculty, academic infrastructure, laboratories, and administrative resources.

8. 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

Capitol Technology University affirms that students in the Bachelor of Science in Intelligent Healthcare Systems Engineering program will be provided with accurate, complete, and timely information regarding all academic and administrative aspects of the program.

Information will be made available through the following means:

- The academic catalog and program webpage will include complete information on the curriculum, credit hour requirements, course descriptions, program outcomes, and degree pathways. These resources are reviewed annually for accuracy and compliance with institutional and accreditation standards.
- Upon admission, students will be assigned an academic advisor who provides individualized degree planning, registration assistance, prerequisite tracking, and career pathway guidance.
- Each course includes a detailed syllabus outlining course objectives, assessment methods, expectations for faculty interaction, office hours, and communication protocols. Faculty maintain regular contact with students through in-person classes, virtual communication, office hours, and capstone project mentoring.
- Technology expectations, including software tools (e.g., MATLAB, Python, modeling platforms) and hardware requirements, are communicated during orientation and in the catalog. Minimum laptop specifications are published by the Office of Information Technology.
- Capitol uses Canvas as its official learning management system (LMS). Course materials, assignments, discussion forums, and grades are delivered through this platform. Students receive training during orientation and have access to LMS technical support throughout their studies.
- Academic support services such as tutoring, writing assistance, library access, and research help are available in person and online. Students are also supported by career services and professional development resources.
- Tuition and fee information, payment policies, and financial aid options (including FAFSA, scholarships, and military benefits) are provided by the Financial Aid Office and Business Office through workshops, advising, and the university website.

These practices ensure that students are well-informed and supported throughout their academic journey and graduate prepared to enter the healthcare technology workforce.

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

Capitol Technology University affirms that all advertising, recruitment, and admissions materials related to the Bachelor of Science in Intelligent Healthcare Systems Engineering will accurately and clearly represent the program's content, structure, outcomes, and available services.

The Office of Marketing and Communications, in collaboration with the Office of Admissions and academic leadership, will ensure that all promotional materials:

- Accurately reflect approved curriculum and program learning outcomes
- Clearly state program duration, credit requirements, and learning modalities
- Transparently communicate tuition, fees, technology expectations, and available support services

Program information will be distributed through official university channels, including:

- The university website, academic catalog, brochures, and social media
- Presentations and materials at open houses, recruitment events, and articulation partner visits
- One-on-one advising sessions with prospective students, where trained admissions counselors and faculty provide consistent and detailed program guidance

All materials will be reviewed regularly to maintain compliance with institutional policies and accreditation standards. Through these measures, Capitol ensures that prospective students receive reliable and comprehensive information to make informed decisions about their education.

H. Adequacy of Articulation

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

   The Bachelor of Science in Intelligent Healthcare Systems Engineering is designed to support seamless transfer and articulation with community colleges and other institutions offering associate degrees in pre-engineering, health sciences, information technology, and related STEM disciplines. The interdisciplinary nature of the program allows for flexibility in accepting a wide range of lower-division coursework that aligns with the program's emphasis on systems engineering, data analytics, and healthcare technologies.

   Capitol Technology University currently maintains articulation agreements with several regional institutions, including Cecil College, Howard Community College, Anne Arundel Community College, and Montgomery College. These agreements provide clear transfer pathways for students completing associate degrees in engineering, computer science, or allied health programs. Additional partnerships are in place with out-of-state institutions such as the Community College of Rhode Island (CCRI) and Columbia Southern University.

   To ensure transfer readiness, the program curriculum has been developed with close alignment to the Maryland Higher Education Commission's general education and transfer credit guidelines. Foundational courses in mathematics (algebra, calculus, statistics), natural sciences (physics, chemistry), and introductory engineering and healthcare systems have been structured to match offerings at Maryland community colleges. This alignment facilitates credit recognition and accelerates degree completion for transfer students.

   The university also actively supports STEM pipeline initiatives with local high schools through its engagement with Project Lead The Way (PLTW), dual enrollment programs, and advisory partnerships with Prince George's County Public Schools (PGCPS). These efforts promote early exposure to healthcare engineering, systems thinking, and emerging technologies in healthcare.

   Capitol Technology University will continue to expand articulation and transfer partnerships to include additional institutions offering associate degrees in pre-health, health informatics, or biomedical technology. Formal articulation agreements specific to the Intelligent Healthcare Systems Engineering program will be finalized and submitted following MHEC approval, in accordance with statewide transfer policies and institutional articulation practices.

I. Adequacy of Faculty Resources

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

   The Bachelor of Science in Intelligent Healthcare Systems Engineering will be delivered by an interdisciplinary team of full-time and adjunct faculty members with academic and professional expertise across engineering, healthcare systems, computer science, project management, and data analytics. Faculty hold terminal degrees in relevant fields and bring significant experience in applied research, clinical systems, systems engineering, and industry-based healthcare innovation.

   The faculty team includes specialists in systems integration, artificial intelligence, healthcare delivery, robotics, control systems, and project planning. Their backgrounds include both academic leadership and active industry practice, ensuring a rich educational experience that blends theoretical foundations with real-world application.

   FULL-TIME FACULTY

   Dr. Mohamed Shehata, Dean of Academics, and the Chair of Engineering Department earned a Ph.D. in Engineering from Purdue University. His Thesis focused on power electronics and its application on electric drive. He leads curriculum planning and teaches courses in engineering design, control systems, Mechatronics and energy systems.

   Dr. Charles D. Conner earned a Ph.D. in Electrical Engineering from The Catholic University of America. With decades of teaching experience and service at Capitol and research institutions, he offers courses in analog/digital systems and signal processing.

   Dr. Andrew Mehri, earned his PhD. in Computer Science with degrees in information architecture and electronics engineering. He has held leadership roles in vocational education and teaches electronics, digital logic, and technical systems design.

   Dr. Naja Hassan, Department Chair of Computer and Data Science, holds a Ph.D. in Business Analytics and Decision Sciences and multiple advanced degrees in computer science and business. He teaches project management and analytics and supports interdisciplinary integration

   Dr. Jeff Chi. earned a Ph.D. in Project Management from the University of Maryland. he led new construction and capital facility management projects, spearheaded a comprehensive environmental and sustainability program, and played a pivotal role in major mergers and acquisitions of national retailers.

   Dr. Tahani Baabdullah is an artificial intelligence and machine learning expert with research and industry experience in deep learning, cybersecurity, and blockchain-integrated AI systems. She holds a Ph.D. in Computer Science and has developed high-accuracy AI models for fraud detection, healthcare, and anomaly detection using Python, TensorFlow, and PyTorch. Her expertise spans neural networks, generative AI, federated learning, and ethical applications of AI across fintech, healthcare, and secure data environments

Dr. Gregory P. Behrmann, Professor, holds a Ph.D. in Mechanical Engineering from The Catholic University of America. He currently serves as Clinical Associate Professor and has held roles as Associate Dean and Senior Research Engineer. His background includes NIH- and DoD-funded research, K–12 STEM outreach, and micro-manufacturing innovation. He teaches engineering design, mechanics, and interdisciplinary senior projects.

Ms. Amelia Wear, Instructor, is a Lead Systems Engineer at Wabtec and holds a B.S. in Mechanical Engineering and an M.S. in Software Engineering. She brings industry expertise in controls, integration, and agile development to instruction in systems design and mechatronics.

Dr. Nisma M. Omar, Adjunct Professor, holds a Ph.D. in Analytical Chemistry and an M.S. in Physical Chemistry. She teaches general education science and mathematics courses. Her experience includes curriculum development, lab instruction, and pharmaceutical testing. She contributes to foundational STEM education and academic success initiatives

Dr. Kellep Charles (Ph.D., Cybersecurity, Capitol Technology University) teaches in the areas of artificial intelligence, cybersecurity, and autonomous systems. He also holds an M.S. in Telecommunication Management from the University of Maryland University College and a B.S. in Computer Science from North Carolina Agricultural and Technical State University.

ADJUNCT FACULTY

Dr. Ali Mehrabi holds B.S. and M.S. degrees in Electrical Engineering and brings extensive industry experience in regulatory affairs and quality systems. He has led FDA 510(k) submissions, EU MDR compliance, and QMS audits at companies such as West Pharmaceutical, Infutronix, BD Medical, and Philips. His expertise bridges engineering, regulatory strategy, and healthcare technology development.

Dr. Alexander Paselk holds a Ph.D. in Occupational Health & Safety and brings nearly 20 years of industry experience in safety leadership, risk mitigation, and regulatory compliance. As a Dissertation Chair at Capitol Technology University, he mentors doctoral students across fields like OHS, AI, and Human Factors, guiding them through research and publication. He also serves on strategic advisory boards, helping organizations enhance safety culture, regulatory alignment, and operational resilience.

Ms. Megan Miskovish, Adjunct Professor of English, holds a B.A. in English from Lynchburg College and an M.S. in Education from Walden University. With experience teaching high school and college-level composition, she supports the program's general education component by teaching writing and communication courses essential for technical professionals

Additional adjunct faculty with expertise in healthcare delivery systems, biomedical technologies, and digital health will be recruited as the program scales. These faculty will support elective courses in telemedicine, supply chain logistics, wearable technologies, and clinical integration.

Table 1. Faculty Teaching Assignments

Faculty Name	Status	Courses
Ms. Megan Miskovish	Adjunct	EN 101, EN 102, HU 331, SS 351
Dr. Jeff Chi	Full-time	BUS 174, BUS 301
Dr. Nisma Omar	Full-time	MA 114, MA 128, CH 120, BIO 120, HCE 200
Dr. Charles Conner	Full-time	MA 261, MA 262, PH 202, EL 150
Dr. Gregory Behrmann	Full-time	PH 201, MEC 370
Ms. Amelia Wear	Full-time	EL 100
Dr. Andrew Mehri	Full-time	EL 200, NT 150
Dr. Mohamed Shehata	Full-time	EE 406
Dr. Tahani Baabdullah	Full-time	CS 120, AIT 201, HCE 350
Dr. Najam Hassan	Full-time	CS 220, DS 235
Dr. Kellep Charles	Full-time	IAE 201
Dr. Alexander Paselk	Adjunct	HCE 310, HCE 410, HCE 440, SDE 457
Dr. Ali Mehrabi	Adjunct	HCE 340, HCE 420, HCE 430, SDE 458

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

   Capitol Technology University provides structured faculty development through its **Center for Innovation in Teaching and Learning (CITL)**. The center offers regular workshops, seminars, and resources designed to improve instructional quality, student engagement, and technology integration.

a) **Pedagogy that meets the needs of the students**
Faculty receive training in inclusive, student-centered teaching practices, with an emphasis on applied learning, case-based instruction, and project-based learning. CITL also facilitates workshops on Universal Design for Learning (UDL), active learning strategies, formative assessment, and scaffolding techniques to address the diverse needs of Capitol's undergraduate population, including first-generation students, adult learners, and those returning from technical careers.

b) **The learning management system**
Canvas is the university's official LMS. All faculty are required to complete onboarding training and are encouraged to attend advanced sessions on using Canvas tools for modular content delivery, grading rubrics, multimedia integration, and real-time analytics. Instructional designers are available to help faculty customize course shells and apply best practices for hybrid and online instruction.

c) **Evidence-based best practices for distance education, if distance education is offered**
Not applicable. The proposed program will be offered in a traditional on-campus format. However, select faculty are trained in online instructional design and may offer hybrid enhancements (e.g., supplemental simulations, Canvas-based project tracking) to support flexibility and experiential learning in select courses.

J. Adequacy of Library Resources

1. **Describe the library resources available and/or the measures to be taken to ensure resources are adequate to support the proposed program.**

Capitol Technology University's Puente Library provides robust academic support for students and faculty through a comprehensive collection of physical and digital resources. For the Bachelor of Science in Intelligent Healthcare Systems Engineering, the library's holdings and services will be fully aligned with the interdisciplinary nature of the program, which spans engineering, healthcare systems, artificial intelligence, project management, and data analytics.

Students and faculty will have access to major scholarly databases including IEEE Xplore, ScienceDirect, SpringerLink, PubMed, ProQuest, and JSTOR, which offer full-text access to peer-reviewed journals, industry white papers, conference proceedings, and technical standards across engineering and healthcare domains. These platforms provide critical resources on topics such as medical device design, health informatics, regulatory standards (e.g., FDA, ISO), systems modeling, and artificial intelligence in clinical environments.

In addition, the library subscribes to specialized resources such as ACM Digital Library, SAGE Journals, and Gale Health and Wellness, supporting research in areas such as health systems policy, clinical decision-making, healthcare quality assurance, and AI-driven diagnostics.

Reference materials, standards documentation, and current textbooks used in the program—including those covering circuit analysis, control systems, bioengineering fundamentals, project management, and ethical issues in healthcare—are available in both print and digital formats. Course reserves are maintained to ensure equitable access to high-use materials.

To ensure ongoing alignment between library holdings and curricular needs, Capitol Technology University follows a continuous improvement model. The Office of Academic Affairs collaborates closely with library staff and program faculty to review acquisitions, identify emerging content areas, and prioritize purchases tied to new course development or accreditation requirements (e.g., ABET, CAHIIM).

Measures to Ensure Adequate Support:

- Annual collection reviews will be conducted to assess the adequacy and currency of materials specific to intelligent healthcare systems engineering.
- Faculty will have the ability to recommend journals, eBooks, and industry case studies for acquisition, with priority given to those tied to senior design, capstone projects, and laboratory courses.
- The library will expand its collection to include healthcare engineering standards (e.g., IEC 60601, ISO 14971) and case-based learning resources aligned with FDA and health technology certification bodies.
- Remote access to all online resources will be maintained, ensuring both on-campus and online learners have equal access to research tools and reference materials.
- Personalized research support, interlibrary loan services, and information literacy instruction will be provided to ensure students can effectively navigate, evaluate, and apply scholarly and technical content in support of their academic and project work.

Capitol Technology University affirms that the Puente Library's existing infrastructure, acquisition policies, and responsive support model are fully adequate to launch and sustain the Bachelor of Science in Intelligent Healthcare Systems Engineering program.

K. Adequacy of Physical Facilities, Infrastructure and Instructional Equipment

1. **Provide an assurance that physical facilities, infrastructure and instructional 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.**

   Capitol Technology University affirms that it possesses the physical facilities, infrastructure, and instructional equipment necessary to successfully launch and support the Bachelor of Science in Intelligent Healthcare Systems Engineering. The University's modern campus in Laurel, Maryland includes well-equipped classrooms featuring high-definition projectors, smartboards, document cameras, multimedia systems, and high-speed wireless internet to support interactive, lecture-based, and hybrid instructional formats.

   Existing laboratory facilities utilized by current engineering, computer science, and technology programs are fully capable of supporting the hands-on and interdisciplinary components of the healthcare systems engineering curriculum. These include:

   - **Electronics and Circuit Analysis Labs**, equipped with Heathkit analog trainers, multimeters, oscilloscopes, and power supplies.
   - **Digital Systems and Microcontrollers Labs**, featuring Arduino Uno kits, Raspberry Pi systems, and programmable logic trainers for embedded systems instruction.
   - **Data Science and AI Labs**, offering workstations with Python, MATLAB, and machine learning libraries used for data analytics, AI model development, and healthcare informatics.
   - **Control Systems and Instrumentation Labs**, with simulation software (MATLAB/Simulink), industrial-grade sensors, and microcontroller-based control systems.
   - **Project and Capstone Studio Spaces**, supporting collaborative prototyping, systems integration, and validation/testing of healthcare engineering projects.

   These labs already serve multiple programs and do not require new capital investments to accommodate the Intelligent Healthcare Systems Engineering program at launch. Additional upgrades or dedicated space expansions will be made as the program scales.

   Faculty and staff are provided with private offices equipped with internet, computers, printers, and phone access. Advising, mentoring, and research supervision are conducted in-person and remotely, with designated meeting spaces and virtual conferencing support. Facilities management conducts space planning reviews annually to assess needs as programs expand.

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:**

Capitol Technology University affirms its commitment to supporting all students and faculty in both on-ground and distance education modalities, with comprehensive digital infrastructure and services.

a) An institutional electronic mailing system

All enrolled students, faculty, and staff are issued official university email accounts hosted on Microsoft Office 365. These email accounts are required for all university communications, including course announcements, academic advising, assignment submission, technical support, and administrative

notifications. The platform provides cloud-based access and integration with other university systems such as Canvas and OneDrive.

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

The university uses **Canvas** as its official learning management system (LMS), which supports all distance and hybrid courses. Canvas provides a robust environment for content delivery, video lectures, quizzes, forums, project collaboration, grading, and feedback. It integrates with Microsoft Teams, Turnitin, and external tools such as MATLAB Grader and GitHub Classroom, supporting a broad range of technical and non-technical instruction.

Faculty receive training in online pedagogy, LMS utilization, and digital engagement strategies. Students are oriented on how to use Canvas and receive continuous support through online help centers and live support from the IT Services department. All digital learning tools are accessible remotely, ensuring equitable participation regardless of student location.

L. Adequacy of Financial Resources with Documentation

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)	$350,060	$707,940	$1,065,072	$1,449,072	$1,851,644
a. Number of F/T Students	8	16	24	32	40
b. Annual Tuition/Fee Rate	$27,808	$28,503	$29,216	$29,946	$30,695
c. Total F/T Revenue (a x b)	$222,464	$465,048	$701,184	$958,272	$1,227,800
d. Number of P/T Students	7	13	19	25	31
e. Credit Hour Rate	$1,519	$1,557	$1,596	$1,636	$1,677
f. Annual Credit Hours	12	12	12	12	12
g. Total P/T Revenue (d x e x f)	$127,596	$242,892	$363,888	$490,800	$623,844
3. Grants, Contracts, External Sources	$0	$0	$0	$0	$0
4. Other Sources	$0	$0	$0	$0	$0
TOTAL (Add 1–4)	**$350,060**	**$707,940**	**$1,065,072**	**$1,449,072**	**$1,851,644**

Narrative Rationale for Table 1: Program Resources

1. **Reallocated Funds**:
   No existing funds will be reallocated. The Intelligent Healthcare Systems Engineering program will launch using Capitol Technology University's current infrastructure, personnel, and instructional platforms without impacting other programs.

2. **Tuition and Fee Revenue**:
   Revenue estimates are based on projected enrollment, starting with 8 full-time and 7 part-time students in Year 1, increasing annually to reach 40 full-time and 31 part-time students by Year 5. Tuition rates reflect the University's published rates with an estimated 2.5% increase per year. Full-time students are charged annually; part-time students are estimated to enroll in 12 credit hours per year.
3. **Grants, Contracts, and Other External Sources**:
   While no grants are budgeted in this proposal, future funding will be sought through workforce innovation grants, NIH and NSF initiatives in digital health and systems engineering, and partnerships with health systems or medical technology companies.
4. **Other Sources**:
   Other potential funding streams (e.g., endowments, donor contributions, industry sponsorships) may be explored after program launch but are not assumed in the initial five-year projection.

2. Complete Table 2: Program Expenditures 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.

TABLE 2: EXPENDITURES

Expenditure Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. Faculty (b + c below)	$113,468	$155,071	$238,421	$325,843	$417,486
a. #FTE	1.5	2	3	4	5
b. Total Salary	$94,557	$129,226	$198,684	$271,536	$347,905
c. Total Benefits (20%)	$18,911	$25,845	$39,737	$54,307	$69,581
2. Admin Staff (b + c below)	$5,942	$6,091	$6,244	$6,400	$6,559
a. #FTE	0.08	0.08	0.08	0.08	0.08
b. Total Salary	$4,952	$5,076	$5,203	$5,333	$5,466
c. Total Benefits	$990	$1,015	$1,041	$1,067	$1,093
3. Support Staff (b + c below)	$59,885	$92,076	$125,837	$161,230	$198,313
a. #FTE	1	1.5	2	2.5	3
b. Total Salary	$49,905	$76,730	$104,864	$134,358	$165,261
c. Total Benefits (20%)	$9,980	$15,346	$20,973	$26,872	$33,052
4. Technical Support and Equipment	$840	$1,425	$2,320	$3,145	$4,140
5. Library	$0	$0	$0	$0	$0
6. New or Renovated Space	$0	$0	$0	$0	$0
7. Other Expenses	$5,850	$14,210	$25,370	$39,330	$56,090
TOTAL (Add 1–7)	**$185,985**	**$268,873**	**$398,192**	**$535,948**	**$682,588**

Narrative Rationale for Table 2: Program Expenditures

1. **Faculty**:
   Faculty salaries and benefits support instruction across healthcare systems, AI, data analytics, engineering fundamentals, and capstone supervision. Faculty FTE grows with enrollment and includes both full-time and adjunct instructors. Benefits are estimated at 20% of salary.
2. **Administrative Staff**:
   A dedicated share of administrative support (0.08 FTE) is allocated for advising, enrollment

tracking, and coordination. Compensation is based on institutional averages with modest annual increases.

3. **Support Staff**:
   Support roles include lab coordinators, simulation support, and technical aides for software and data systems. As hands-on and project-based courses increase, support staff grows proportionally to maintain lab readiness and student assistance.
4. **Technical Support and Equipment**:
   Includes software licenses (e.g., MATLAB, Simulink, SPSS, Python environments), cloud computing access, and health systems modeling tools. Increases annually with student usage and course needs.
5. **Library**:
   No new library costs are anticipated, as existing databases (e.g., IEEE, ScienceDirect, JSTOR, ProQuest Health, and SpringerLink) provide access to key research materials.
6. **New or Renovated Space**:
   No capital expansion is needed. Existing engineering, computing, and healthcare-related lab spaces will accommodate the new program's needs.
7. **Other Expenses**:
   Includes program promotion, materials, professional development, guest speakers, and accreditation-related documentation. These expenses scale with enrollment and academic programming.
8. **Total Expenditures**:
   The program budget grows with enrollment and course offerings. The model ensures fiscal sustainability by Year 3 and full alignment with the university's strategic growth in healthcare-related interdisciplinary programs.

M. Adequacy of Provisions for Evaluation of Program

1. Procedures for Evaluating Courses, Faculty, and Student Learning Outcomes

Capitol Technology University has established institutional procedures to ensure the academic quality and continuous improvement of all programs. For the Bachelor of Science in Applied Engineering, the following evaluation processes will be implemented:

- **Course Evaluation**: Each course will be evaluated by students at the end of every semester using a standardized university-wide instrument. These evaluations assess instructional effectiveness, clarity of course objectives, learning resources, and overall student satisfaction.
- **Faculty Evaluation**: Faculty are evaluated through a combination of student feedback, peer observation, and annual performance reviews conducted by department chairs and the Dean of Academic Affairs. The review process supports faculty development and instructional improvement.
- **Student Learning Outcomes Assessment**: Student Learning Outcomes (SLOs) will be assessed at both the course and program levels. Faculty will use assignment rubrics, lab assessments, and exam data to evaluate student performance against defined outcomes. Assessment results are reviewed in regular departmental meetings to guide curriculum refinement and instructional strategies.

2. Evaluation of Program Educational Effectiveness

The effectiveness of the Applied Engineering program will be assessed using a combination of direct and indirect measures, consistent with Capitol Technology University's institutional assessment framework. Key components include:

- **Assessment of Student Learning Outcomes**:
  The program will implement a systematic outcomes-based assessment plan aligned with ABET standards. Faculty will collect data from capstone design projects, technical reports, lab performance, and embedded course assessments to evaluate competencies in areas such as engineering design, teamwork, communication, and problem-solving.
- **Retention and Graduation Rates**:
  The university will monitor retention and graduation rates at the program level to evaluate student persistence and progression. Early alert systems and proactive advising will be used to support students at risk of attrition.
- **Student and Faculty Satisfaction**:
  Annual surveys will be administered to students and faculty to evaluate satisfaction with curriculum quality, instructional support, lab resources, and advising services. Feedback will inform program enhancements and resource planning.
- **Cost-Effectiveness**:
  The Division of Business and Finance, in collaboration with Academic Affairs, will conduct annual reviews of the program's financial sustainability. These evaluations will examine enrollment trends, instructional costs, and overall return on investment.
- **Accreditation and Advisory Board Input**:
  The program will seek ABET accreditation under the Engineering Accreditation Commission (EAC). Regular feedback from the Applied Engineering Industry Advisory Board will ensure program relevance, alignment with employer expectations, and responsiveness to emerging workforce demands.

N. Consistency with the State's Minority Student Achievement Goals

1. Addressing Minority Student Access, Success, and Cultural Diversity Goals

The proposed Bachelor of Science in Applied Engineering program directly supports Maryland's goals to enhance access, retention, and completion among minority and underrepresented student populations, as articulated in COMAR 13B.02.03.05 and the *Maryland State Plan for Postsecondary Education*. Capitol Technology University is committed to inclusive excellence and has a demonstrated record of supporting diversity in STEM education.

The Applied Engineering program is structured to promote equity in access and success by:

- **Creating transfer pathways** for community college students, many of whom come from diverse and underserved populations. Advising support and articulation agreements will ease the transition to the university.
- **Providing targeted academic support**, including early alert systems, mentoring, tutoring, and proactive advising, to improve retention and graduation rates among minority students.

- **Offering financial support** through institutional scholarships, need-based aid, and federal grant programs to reduce economic barriers to entry for first-generation, low-income, and underrepresented students.
- **Fostering inclusive pedagogy** through faculty training in culturally responsive teaching, Universal Design for Learning (UDL), and active learning strategies known to improve STEM retention for diverse learners.
- **Integrating experiential learning** through hands-on labs and project-based coursework that engages students and enhances career readiness, particularly for students who thrive in applied, practical learning environments.

Furthermore, Capitol Technology University supports a welcoming campus climate through:

- Student organizations and affinity groups that represent a variety of cultural, racial, and identity-based communities.
- Campus-wide multicultural programming and events that promote cross-cultural understanding and belonging.
- Ongoing integration of equity and diversity into the University's strategic goals and institutional effectiveness plans.

By broadening participation in engineering education and fostering a supportive learning environment, the Applied Engineering program advances both Goal 1 (Access) and Goal 2 (Success) of Maryland's State Plan for Postsecondary Education. It aims to close equity gaps and contribute to a more diverse, inclusive, and representative engineering workforce in the state and beyond.

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.**

The proposed Bachelor of Science in Applied Engineering is not a direct continuation or restructuring of a specific low-productivity program currently identified by the Maryland Higher Education Commission. However, it has been strategically developed in response to internal reviews of program performance and enrollment trends within traditional engineering programs, particularly those that have experienced declining enrollment and graduation rates over recent years.

Capitol Technology University is proactively addressing these challenges by redirecting instructional and administrative resources from underperforming or narrowly specialized engineering programs toward the Applied Engineering program. This includes reallocating existing faculty, classroom space, laboratory infrastructure, and academic support services to better serve a broader, interdisciplinary curriculum that aligns with market demand and student interest.

The new program will:

- Leverage faculty expertise across multiple engineering disciplines who are currently underutilized in low-enrollment programs.
- Utilize shared laboratory and instructional equipment to reduce operational costs while maintaining hands-on learning quality.
- Promote enrollment growth through transfer pathways and workforce alignment, improving overall program productivity and resource utilization.

In this way, while not officially replacing a designated low-productivity program, the BS in Applied Engineering represents an intentional reallocation of academic resources to maximize institutional effectiveness and better meet regional workforce needs.

P. Adequacy of Distance Education Programs

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

Capitol Technology University is fully authorized by the Maryland Higher Education Commission (MHEC) to offer distance education programs. The university has extensive experience delivering online and hybrid instruction across undergraduate and graduate levels in engineering, technology, and business disciplines. Capitol is also a participant in the National Council for State Authorization Reciprocity Agreements (NC-SARA), which allows it to offer distance education to students in other SARA member states.

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 affirms that it complies with the Council of Regional Accrediting Commissions (C-RAC) guidelines for the evaluation of distance education. The university ensures the following:

- Curriculum quality and rigor are consistent across on-campus and distance-delivered formats.
- Regular and substantive faculty-student interaction is maintained through scheduled virtual class sessions, discussion boards, and timely feedback on assignments.
- Verification of student identity is conducted through secure login protocols and assessment systems that protect academic integrity.
- Accessible student services (including advising, tutoring, library access, and career counseling) are provided to all online students, equal to those offered to campus-based students.
- Technology infrastructure and support are in place to ensure reliable access to the learning management system (Canvas), online communication tools, and technical assistance.
- Faculty training in online pedagogy and LMS use is required for instructors delivering online or hybrid courses.

While the BS in Applied Engineering will be delivered primarily in an on-campus format due to its hands-on and lab-intensive nature, select courses—particularly in general education, computing, and technical electives—may be offered through online or hybrid delivery. All such offerings will adhere strictly to institutional and accreditation standards for distance education.