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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 # 99204 (●) Check # 99204
Payment Amount:
Date Submitted: 11/9/2025

Department Proposing Program	Engineering	
Degree Level and Degree Type	Bachelor of Science (B.S.)	
Title of Proposed Program	Bachelor of Science in Civil Engineering	
Total Number of Credits	120	
Suggested Codes	HEGIS: 0908.00	CIP: 14.0801
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

Bachelor of Science (B.S.) in Civil Engineering

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 Civil Engineering is a 120-credit undergraduate degree designed to prepare students for professional careers in the planning, design, construction, and maintenance of infrastructure systems. The program integrates foundational civil engineering principles with applied learning in structural analysis, geotechnical design, transportation systems, environmental engineering, and construction management. Graduates will be equipped to address complex engineering challenges involving buildings, bridges, transportation networks, water resources, and sustainable urban development.

The curriculum emphasizes experiential learning, combining rigorous mathematics and science preparation with laboratory applications and fieldwork. Core coursework covers mechanics, surveying, materials, hydraulics, and design using current engineering codes and standards. Students also gain technical proficiency in computer-aided design, programming, and data analytics to meet the evolving needs of modern civil engineering practice. The program culminates in a two-semester senior design sequence, where teams develop and present comprehensive design solutions that incorporate real-world constraints such as safety, cost, sustainability, and ethics.

The curriculum includes 30 credits of mathematics and science, 21 credits of general education and ethics, 48 credits of civil and construction engineering core, 9 credits of computing and analytical tools, and 12 credits of technical electives and capstone. This balance ensures that graduates possess not only strong technical and analytical abilities but also communication, teamwork, and professional responsibility skills.

The B.S. in Civil Engineering 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. We provide relevant learning experiences that lead to success in the evolving global community."* The program fulfills this mission by preparing graduates to design, manage, and maintain critical infrastructure systems that support public welfare and sustainable development throughout Maryland and beyond.

The program supports Capitol's Strategic Vision 2025 by:

- Delivering hands-on, STEM-focused education that meets the infrastructure and sustainability needs of the 21st-century workforce.
- Strengthening interdisciplinary collaboration between civil, mechanical, environmental, and construction management disciplines.
- Expanding Civil engineering offerings that position Capitol as a leader in practice-oriented engineering education.

- Contributing to institutional enrollment growth through a program that appeals to both traditional and transfer students interested in construction, sustainability, and public works engineering.

2. Institutional Strategic Goals and Priority Alignment

The proposed Bachelor of Science in Civil Engineering supports Capitol Technology University's strategic plan for academic growth, workforce alignment, and applied research in infrastructure systems.

It advances Goal I: Expand Educational Offerings and Increase Program Completion by introducing a core engineering discipline focused on civil infrastructure and sustainable design. The program's applied emphasis and integration of surveying, construction management, and design software appeal to students seeking careers in design, construction, and public service.

It supports Goal II: Increase Enrollment and Institutional Awareness by attracting students interested in traditional civil engineering and construction fields that remain in high regional demand. The program complements existing offerings in mechanical, electrical, and applied engineering, enabling cross-disciplinary collaboration and dual-enrollment pathways.

The program aligns with Goal III: Optimize Utilization of University Resources through the use of shared courses and laboratories in mechanics, materials, and construction systems. Many foundational courses already exist within accredited engineering programs, allowing efficient implementation and shared faculty expertise.

It contributes to Goal IV: Strengthen Partnerships and Industry Collaboration by fostering relationships with public agencies, construction firms, and engineering consultancies in Maryland and the mid-Atlantic region. Civil engineering is foundational to regional economic development, and the program will support internships, capstone projects, and applied research partnerships in transportation, environmental systems, and sustainable infrastructure.

3. Program Funding and Resource Commitment

The Bachelor of Science in Civil Engineering will be implemented using existing institutional resources, supported by tuition revenue and strategic allocation of instructional capacity within the School of Engineering.

Because the program draws extensively from existing courses in applied and Civil Engineering, construction management, and environmental systems, it can be launched without significant new investment in facilities or laboratory infrastructure. Current laboratories—such as those for materials testing, fluid mechanics, and construction systems—are equipped to support instruction and design projects. Incremental equipment and software purchases for surveying, geotechnical testing, and civil design software (AutoCAD Civil 3D, Revit, MATLAB) will be incorporated into the university's annual budgeting plan as enrollment grows.

Instructional staffing will rely on current full-time faculty and adjunct instructors with expertise in civil and construction engineering. The expected student-to-faculty ratio will remain consistent with other engineering programs, ensuring personalized instruction and mentorship. The program is projected to become self-sustaining within three years, with tuition revenue covering faculty compensation, laboratory operations, and software licensing. The financial plan reviewed by Academic Affairs and Business and Finance confirms feasibility under existing resource structures.

4. Institutional Commitment

Capitol Technology University is fully committed to the successful launch, continuous improvement, and long-term sustainability of the Bachelor of Science in Civil Engineering program.

a) Administrative and resource support:
The program will be administered by the School of Engineering under the supervision of the Dean of Engineering. Administrative oversight, budgeting, and scheduling will be managed through the Office of Academic Affairs. Existing laboratories, computing facilities, and field equipment will be maintained and upgraded to ensure state-of-the-art learning environments.

b) Program continuity for enrolled students:
The university guarantees uninterrupted program delivery for all admitted students. In the event of curriculum modification or restructuring, Capitol will implement a formal teach-out plan to ensure timely degree completion. The university's accreditation history and institutional stability provide assurance of long-term program continuity.

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 Civil Engineering advances the knowledge and practice of infrastructure design, construction, and sustainability. Civil engineering is one of the most essential and enduring engineering disciplines, supporting society's built environment—including transportation networks, bridges, buildings, water systems, and public works. The program prepares students to apply principles of structural mechanics, materials science, fluid systems, and geotechnical design using modern analytical and computational tools.

The curriculum integrates traditional areas of study—surveying, structural analysis, transportation, and geotechnical engineering—with emerging topics such as sustainable design, environmental systems, and data analytics for infrastructure management. Students gain experience using digital modeling, GIS, and construction management software that reflect current industry standards. By combining theoretical knowledge with field and laboratory application, the program enhances Maryland's capacity to produce civil engineers who can plan, design, and maintain resilient and sustainable infrastructure systems vital to the State's economic growth and environmental stewardship.

b) Societal needs, including expanding educational opportunities and choices for minority and educationally disadvantaged students at institutions of higher education

The program expands educational opportunity and workforce participation by offering a practice-oriented civil engineering pathway accessible to a diverse student population. Capitol Technology University has a strong record of serving first-generation college students, underrepresented minorities, veterans, and community-college transfers. The B.S. in Civil Engineering builds upon this tradition by providing small class sizes, individualized faculty mentorship, and hands-on project experiences that promote retention and success.

The program's alignment with Maryland's community-college transfer pathways and its emphasis on applied learning enable broader access to a high-demand STEM discipline. By incorporating practical fieldwork, construction management, and sustainability applications, the curriculum appeals to both traditional and non-traditional learners seeking career advancement in public infrastructure, construction, and environmental protection. These efforts directly support Maryland's goal of strengthening equity, inclusion, and educational attainment in the technical workforce.

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 an HBI, it actively collaborates with Maryland's historically black institutions through transfer agreements, joint outreach, and engineering education initiatives. The B.S. in Civil Engineering supports statewide efforts to expand STEM capacity by serving as a complementary and transfer-friendly program. Opportunities for joint capstone projects, research in sustainable infrastructure, and faculty collaboration strengthen Maryland's collective ability to educate engineers from underrepresented populations. In doing so, the program contributes to the State's broader objective of diversifying and expanding the civil and environmental engineering workforce.

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

The Maryland State Plan for Postsecondary Education identifies three overarching goals—**Student Access**, **Student Success**, and **Innovation**—all of which are advanced by this program.

Goal 1: Student Access

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

The B.S. in Civil Engineering broadens access to high-quality, affordable engineering education for Maryland students. Capitol Technology University maintains strong articulation pathways with regional community colleges and participates in dual-enrollment and transfer initiatives that promote seamless progression into bachelor-level engineering study. The program welcomes recent high-school graduates, military personnel, working professionals, and transfer students seeking careers in infrastructure and construction.

Institutional scholarships, veterans' benefits, and need-based financial aid make the program attainable to a wide population. Its applied, project-based learning model particularly serves students who learn best through experiential instruction. These practices align with the State Plan's Priority 1 (Affordability), Priority 2 (Financial Literacy and Planning), and Priority 4 (Access for Underserved Populations) by reducing barriers to participation in high-demand STEM fields.

Goal 2: Student Success

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

The program promotes success through experiential learning, field-based projects, and progressive skill development across the curriculum. Students engage in laboratories, surveying exercises, computer-aided design, and construction simulations that integrate theory with real-world practice. Comprehensive advising, mentoring, and academic support foster persistence and on-time completion.

The two-semester senior design capstone sequence provides an applied platform for students to synthesize knowledge, address professional standards, and demonstrate teamwork and communication skills. Internship opportunities with local engineering firms, contractors, and public agencies strengthen career readiness. These strategies align with the State Plan's Priority 5 (Commitment to Quality Education), Priority 6 (Timely Program Completion), and Priority 7 (Lifelong Learning and Career Readiness).

Goal 3: Innovation

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

The B.S. in Civil Engineering embodies innovation through its integration of construction management, sustainability, and digital technologies. The curriculum introduces programming and data-science courses that enable students to apply computational analysis to surveying, environmental modeling, and structural design. Modern design software and GIS applications enhance learning efficiency and industry relevance.

The program's use of existing laboratories, shared faculty expertise, and simulation tools promotes cost-effective and innovative program delivery while maintaining high academic standards. By combining civil, construction, and data-analytic components, the program prepares graduates for the rapidly evolving, technology-driven infrastructure sector. These features align with the State Plan's Priority 8 (Innovative Pedagogy), Priority 9 (Expansion of Innovative Academic Practices), and Priority 10 (Work-Based Learning and Applied Experience).

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

1. Potential Industries, Employment Opportunities, and Expected Level of Entry

Graduates of the Bachelor of Science in Civil Engineering will be prepared for professional careers in Maryland's expanding infrastructure, transportation, construction, and environmental sectors. Civil engineering remains one of the most in-demand and foundational disciplines, supporting the design, construction, and maintenance of the built environment—from highways, bridges, and airports to water systems, foundations, and sustainable structures.

Students completing the program will qualify for positions such as Civil Engineer, Structural Engineer, Transportation Engineer, Geotechnical Engineer, Construction Engineer, Project Engineer, Environmental Engineer, and Site Development Engineer. Entry-level roles typically involve design, field inspection, or project coordination, with advancement to senior engineering and project-management positions following professional licensure (EIT/PE) and experience.

The curriculum's integration of surveying, structural analysis, geotechnical design, and construction management equips graduates to contribute immediately to multidisciplinary engineering and public-works teams. Through fieldwork, laboratory courses, and the two-semester senior design capstone, students gain practical experience in applying engineering principles to real-world projects that balance safety, sustainability, and cost.

2. Market Demand and Employment Outlook

According to the U.S. Bureau of Labor Statistics (BLS, 2024), employment of civil engineers is projected to grow 5 percent from 2023 to 2033, faster than the average for all occupations. Nationally, the BLS projects approximately 21,200 openings each year due to growth and replacement needs. The median annual wage for civil engineers in 2024 was $95,820, reflecting steady demand across both public and private sectors.

In Maryland, civil engineers play a vital role in the State's infrastructure modernization initiatives, including transportation expansion, flood mitigation, sustainable construction, and urban redevelopment. Data from the Maryland Department of Labor (2024) indicate projected growth of 8.7 percent in civil and environmental engineering occupations between 2022 and 2032, corresponding to more than 500 annual openings statewide.

Key employment sectors include:

- Transportation and infrastructure agencies such as the Maryland Department of Transportation (MDOT) and Maryland Transportation Authority.
- Construction and consulting firms including Whiting-Turner, Clark Construction, AECOM, and WSP USA.
- Environmental and water-resource organizations addressing sustainability, storm-water management, and climate resilience.
- Federal and defense agencies such as the U.S. Army Corps of Engineers and NASA Goddard, which require civil engineers for facilities and site development.

Maryland's ongoing investments in transportation corridors, coastal infrastructure, and green-building initiatives ensure consistent regional demand for graduates with civil-engineering credentials and construction-management knowledge.

3. Market Surveys and Labor-Force Projections

Labor-market data and workforce-development analyses confirm sustained demand for civil-engineering professionals.

- The Maryland Department of Labor's Occupational Projections (2022–2032) identify continuous growth in architecture, construction, and civil-engineering fields, with civil engineers ranked among the top occupations requiring a bachelor's degree.
- The Georgetown University Center on Education and the Workforce (2023) projects that 69 percent of Maryland jobs will require postsecondary education or training by 2031, with engineering and construction among the highest-growth clusters.
- The Maryland Statewide Workforce Development Plan (2024–2028) highlights urgent needs in transportation infrastructure, coastal protection, environmental remediation, and construction technology—all reliant on civil-engineering expertise.
- Real-time postings from Lightcast (2024) and LinkedIn Jobs show consistent demand in Maryland and the Washington-Baltimore corridor for Civil Engineer, Project Engineer, Transportation Designer, and Structural Engineer, particularly within public-sector and infrastructure firms.

These sources collectively demonstrate a robust and enduring market for civil-engineering graduates prepared with design, construction, and sustainability competencies.

4. Current and Projected Supply of Graduates

The current supply of civil-engineering graduates in Maryland remains below projected workforce demand. According to the U.S. Department of Education's Integrated Postsecondary Education Data System (IPEDS, 2022), Maryland institutions awarded approximately 340 bachelor's degrees in civil engineering in the most recent reporting year. By comparison, statewide employment data show more than 8,000 practicing civil engineers and several hundred annual openings, underscoring a persistent talent gap as infrastructure projects expand.

Existing civil-engineering programs in the State are concentrated at large public universities and emphasize research or theoretical modeling. The proposed program at Capitol Technology University distinguishes itself through a practice-based, applied curriculum that combines civil-engineering fundamentals with construction management, surveying, and data-driven analysis. Students graduate job-ready, experienced in CAD, GIS, and industry-standard design software—skills that employers consistently identify as critical.

Projected enrollment and graduation for the B.S. in Civil Engineering are as follows:

- Year 1: 15–20 students
- Year 3: 40–50 students
- Year 5: 60–75 students
- Graduates by Year 5: 10–15 annually

These graduates will help meet Maryland's ongoing workforce needs in transportation, construction, environmental protection, and urban infrastructure development, ensuring a pipeline of professionals capable of supporting the State's economic growth and sustainability goals.

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.

Several institutions in Maryland offer bachelor's degrees in civil or closely related engineering fields. Under CIP Code 14.0801 – Civil Engineering, the following Maryland institutions offer comparable programs:

- University of Maryland, College Park – B.S. in Civil and Environmental Engineering
- Johns Hopkins University – B.S. in Civil Engineering
- Morgan State University – B.S. in Civil Engineering
- United States Naval Academy – B.S. in Civil Engineering
- University of Maryland Eastern Shore – B.S. in Construction Management Technology (Civil focus)

While these programs provide strong preparation in traditional civil-engineering theory, most are housed within large research universities and emphasize analytical modeling and advanced research. In contrast, Capitol Technology University's proposed Bachelor of Science in Civil Engineering offers a practice-oriented, hands-on approach that integrates civil design, construction management, and digital technologies within an applied learning environment.

Capitol's curriculum combines foundational coursework in structural, geotechnical, transportation, and environmental engineering with courses in construction methods, legal issues, and project management, uniquely bridging engineering design and construction practice. The inclusion of surveying, data science, and programming also prepares students for emerging areas such as smart infrastructure, geospatial analysis, and sustainable urban systems.

The program leverages Capitol's existing strengths in engineering technology, applied engineering, and computer science, enabling interdisciplinary collaboration and efficient use of laboratories for materials testing, fluid mechanics, and environmental systems. With small class sizes and extensive faculty mentorship, the program provides a more individualized and career-focused educational experience than large public institutions can typically offer.

In summary, while other Maryland universities deliver civil-engineering programs, Capitol Technology University's degree is distinctive for its integration of construction management, sustainability, and data-driven design tools, delivered through an applied, project-based framework aligned with workforce and industry needs in Maryland's growing infrastructure and construction sectors.

2. Provide justification for the proposed program.

The Bachelor of Science in Civil Engineering at Capitol Technology University fills a unique and necessary niche within Maryland's higher-education landscape. Although civil-engineering degrees are available at other state institutions, Capitol's program provides a practice-based alternative that complements existing offerings and addresses unmet needs for applied, workforce-ready civil engineers.

a) Workforce Demand:
Maryland's economy relies heavily on the construction, transportation, and environmental sectors—all of which require a steady supply of civil engineers to design, maintain, and modernize infrastructure. Public agencies such as the Maryland Department of Transportation (MDOT), Maryland Transit Administration, Maryland Department of the Environment, and the U.S. Army Corps of Engineers, as well as private firms including Clark Construction, Whiting-Turner, and AECOM, consistently report strong demand for engineers with applied design, construction, and management expertise. The proposed program directly supports this demand by emphasizing surveying, project delivery, and sustainable infrastructure systems.

b) Academic Need:
The program complements rather than duplicates existing civil-engineering offerings by focusing on hands-on, applied instruction that incorporates construction management and emerging technologies such as GIS, CAD/BIM, and data analytics. Its integration of design and fieldwork ensures graduates possess the technical and managerial competencies required by modern infrastructure projects. The program's inclusion of environmental systems and sustainability aligns with Maryland's focus on climate resilience and green-infrastructure initiatives.

c) Accessibility and Flexibility:
Capitol Technology University serves a diverse student population that includes transfer students, adult learners, and working professionals. The program's structure, accessible location in the Baltimore–

Washington corridor, and flexible scheduling options make it attractive to students unable to attend large public institutions. Articulation agreements with Maryland community colleges further enhance accessibility and promote seamless transfer into the program.

d) Institutional Alignment:
The proposed program aligns with Capitol Technology University's mission to deliver career-focused, hands-on STEM education that addresses regional workforce needs. It supports Maryland's strategic priorities to expand access to STEM education, foster innovation in infrastructure and sustainability, and strengthen partnerships between higher education and industry.

In conclusion, the B.S. in Civil Engineering at Capitol Technology University is justified by strong workforce demand, clear academic distinctiveness, and alignment with institutional and statewide priorities. The program offers a distinctive, applied civil-engineering education that complements existing programs in Maryland while preparing graduates to lead the design and construction of the state's future infrastructure.

E. Relevance to High-Demand Programs at Historically Black Institutions (HBIs)

1. Program Impact on High-Demand Programs at HBIs

The proposed Bachelor of Science in Civil Engineering at Capitol Technology University is designed to complement rather than compete with existing high-demand civil and construction-related engineering programs offered at Maryland's Historically Black Institutions (HBIs). Institutions such as Morgan State University and the University of Maryland Eastern Shore (UMES) have long-standing, ABET-accredited programs in civil engineering and construction management that play a critical role in increasing representation of underrepresented populations in STEM fields.

These HBI programs are essential to Maryland's ongoing efforts to expand participation in engineering, strengthen workforce diversity, and advance the State's infrastructure and economic development goals. Capitol Technology University's Civil Engineering program differs in structure, scale, and intended audience by emphasizing applied, practice-based learning, construction integration, and data-driven design. It is tailored for students seeking a smaller, hands-on environment, including community-college transfers, working professionals, and adult learners who may prefer a more applied educational experience.

The program is not expected to divert enrollment from HBI civil-engineering programs; instead, it enhances the State's overall capacity to prepare civil engineers to meet Maryland's growing infrastructure needs. Potential areas of collaboration and mutual benefit include:

- Establishing transfer and articulation pathways for students completing pre-engineering or associate-level programs at HBIs who wish to pursue an applied civil-engineering degree focused on construction and infrastructure systems.
- Creating joint capstone projects or applied research opportunities in areas such as sustainable design, transportation infrastructure, environmental systems, and urban resilience.
- Supporting statewide workforce initiatives that expand the number of licensed civil engineers while promoting diversity and inclusion across Maryland's engineering professions.

By aligning its applied focus with Maryland's infrastructure and sustainability priorities, the B.S. in Civil Engineering at Capitol Technology University will complement and reinforce HBI offerings, not duplicate them. Its introduction strengthens the State's collective effort to broaden access to civil-engineering education, enhance workforce readiness, and ensure that underrepresented groups continue to play a leading role in Maryland's engineering and construction sectors.

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 Civil Engineering is not expected to negatively impact the uniqueness, institutional identity, or mission of Maryland's Historically Black Institutions (HBIs). Rather, it complements the state's collective effort to expand access to high-quality, workforce-aligned STEM education and to increase representation of underrepresented populations in engineering and technology fields.

Maryland's HBIs, including Morgan State University, Bowie State University, Coppin State University, and the University of Maryland Eastern Shore, have longstanding missions centered on educational equity, leadership development, and community advancement. These institutions play a vital role in preparing African American students for professional success in science, engineering, and technology disciplines.

The proposed Civil Engineering program differs from HBI offerings in both focus and delivery. It emphasizes applied, hands-on learning, smaller class environments, and direct pathways for community college transfers, working professionals, and adult learners. The program is structured to meet EAC-ABET accreditation standards and prepare graduates for professional licensure, ensuring rigorous academic quality while maintaining accessibility for nontraditional students.

The program does not duplicate the academic missions or program strengths of HBIs but instead fills a complementary role in Maryland's higher education landscape. Opportunities for collaboration include shared workforce initiatives, articulation agreements, joint applied research projects, and cooperative senior design experiences. These partnerships would strengthen the collective capacity of Maryland's higher education institutions to address statewide workforce needs in engineering and manufacturing.

By expanding the number of students who can access Civil-engineering education in Maryland, the program aligns with the shared objectives of HBIs and Capitol Technology University to promote diversity, equity, and inclusion in STEM. It supports the state's broader mission of ensuring that underrepresented students have multiple, flexible pathways to professional engineering careers while maintaining the unique contributions and institutional identities of Maryland's HBIs.

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

1. Program Establishment and Faculty Oversight

The Bachelor of Science in Civil Engineering was developed through collaboration among faculty in the School of Engineering, the Office of Academic Affairs, and members of the Industry Advisory Board. The program was created in response to Maryland's growing need for professionals skilled in sustainable infrastructure design, transportation systems, environmental engineering, and construction management.

The curriculum builds upon Capitol Technology University's existing strengths in applied engineering, construction management, and data-driven design, integrating established courses from mechanical, applied, and construction engineering programs. The program aligns with current EAC-ABET accreditation standards for civil engineering by covering fundamental knowledge areas including mechanics, materials, fluid systems, geotechnical design, structural analysis, transportation, and environmental systems.

The program will be overseen by full-time faculty within the School of Engineering who hold doctoral and master's degrees in civil, structural, environmental, or geotechnical engineering. Faculty bring both academic and professional experience in public works, construction, and structural design. As enrollment grows, adjunct faculty with specialized expertise in hydraulics, surveying, and construction law will support instruction and senior design project supervision.

2. Educational Objectives and Learning Outcomes

The B.S. in Civil Engineering will be delivered primarily in a face-to-face, on-campus format, with select courses offered in hybrid or online modalities to accommodate working professionals and transfer students. Laboratory and fieldwork components are integral to the program, reinforcing theoretical principles through direct application, measurement, and design.

Educational Objectives

Graduates of the Civil Engineering program will:

1. Be prepared for entry-level engineering positions in areas such as structural, geotechnical, transportation, environmental, and construction engineering.
2. Apply civil-engineering principles to design, analyze, and manage sustainable infrastructure systems.
3. Demonstrate professional ethics, effective communication, and teamwork in engineering practice.
4. Pursue lifelong learning, professional licensure (EIT/PE), and advanced study in civil or related fields.

Learning Outcomes

Upon graduation, students will be able to:

1. Identify, formulate, and solve complex civil-engineering problems by applying principles of engineering, science, and mathematics.
2. Apply engineering design to produce solutions that meet specified needs considering public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. Communicate effectively with a range of audiences through reports, drawings, and presentations.
4. Recognize ethical and professional responsibilities in engineering practice and make informed judgments that consider global and societal impacts.

5. Function effectively on multidisciplinary teams that establish goals, plan tasks, and deliver engineering solutions.
6. Develop and conduct appropriate experiments, analyze and interpret data, and use engineering judgment to draw conclusions.
7. Acquire and apply new knowledge as needed, using appropriate learning strategies and modern tools such as CAD, GIS, and project management software.

These outcomes are fully aligned with ABET Student Outcomes (1–7) and reflect both academic rigor and professional relevance.

3. Assessment of Student Learning Outcomes

a) Assessment of Achievement
Student learning outcomes will be assessed through direct and indirect methods, including examinations, laboratory assignments, field reports, design projects, and oral presentations. Each course will define specific learning outcomes mapped to overall program outcomes. Faculty will collect and review assessment data every semester and analyze trends annually to ensure continuous improvement.

The two-semester Senior Design Capstone (SDE 457–458) will serve as the primary comprehensive assessment of student achievement, evaluating integration of technical knowledge, teamwork, ethics, and communication. The School of Engineering Assessment Committee will review results annually, with findings shared with the Office of Academic Affairs for institutional reporting and improvement.

b) Documentation of Outcomes
Capitol Technology University maintains a centralized digital assessment repository for course and program data. Faculty maintain course portfolios containing representative samples of student work, rubrics, and analyses. Trends in student performance are documented annually, and results are incorporated into program self-studies for continuous improvement and future EAC-ABET accreditation reviews.

4. Program Requirements and Course Distribution

The **Bachelor of Science in Civil Engineering** is a **120-credit degree** designed to prepare students for professional practice, licensure, and graduate study. The curriculum emphasizes applied learning, hands-on fieldwork, and the use of modern engineering tools in surveying, structural analysis, and construction management.

Category	Description	Credits
General Education	Courses in English, ethics, business, arts, and social sciences develop communication, leadership, and professional skills.	21
Mathematics and Science	Courses provide a strong analytical and scientific foundation through mathematics, physics, and chemistry.	30
Civil & Construction Core	Courses develop expertise in surveying, structures, geotechnical design, transportation, and environmental systems, supported by field and laboratory work.	48

Computing & Analytical Tools	Courses provide programming, data analysis, and electrical fundamentals relevant to modern civil design and automation.	9
Technical Electives & Capstone	Discipline-specific electives and a two-semester senior design project integrate design, management, and sustainability concepts.	12
Total		**120**

Bachelor of Science in Civil Engineering – Curriculum

Total Credits: 120

I. General Education (21 Credits)

Course No.	Course Title	Credits
EN 101	English Communications I	3
EN 102	English Communications II	3
HU 331	Arts and Ideas	3
SS 351	Ethics	3
BUS 174	Introduction to Business and Management	3
BUS 301	Project Management	3
Social Science Elective	Elective	3

II. Mathematics and Science (30 Credits)

Course No.	Course Title	Credits
MA 114	Algebra & Trigonometry	4
MA 128	Introduction to Statistics	3
MA 261	Calculus I	4
MA 262	Calculus II	4
MA 330	Linear Algebra	3
MA 340	Differential Equations	3
PH 201	General Physics I	3
PH 202	General Physics II	3
CH 120	Chemistry	3

III. Civil and Construction Engineering Core (48 Credits)

Course No.	Course Title	Credits
CM 120	Introduction to Construction Management	3
CM 125	Construction Graphing and Plan Reading	3
CM 220	Construction Methods and Materials	3
CM 250	Legal Issues in Construction	3
CM 375	Mechanical and Electrical Construction	3
CM 380	Environmental Systems	3
CE 110	Plane and Topographic Surveying	3
CE 310	Structural Analysis	3
CE 315	Design of Reinforced Concrete	3
CE 320	Steel Structure Analysis and Design	3
CE 330	Geotechnical and Geological Engineering	3
CE 350	Transportation Engineering	3

MEC 210	Engineering Mechanics – Statics	3
MEC 255	Mechanics of Materials and Materials Science	3
MEC 310	Engineering Mechanics – Dynamics	3
MEC 330	Fluid Mechanics	3

IV. Computing and Analytical Tools (9 Credits)

Course No.	Course Title	Credits
CS 120	Introduction to Programming Using Python	3
DS 101	Introduction to Data Science	3
EL 100	Introduction to DC/AC Circuits	3

V. Technical Electives and Capstone (12 Credits)

Course No.	Course Title	Credits
Technical Elective I	Discipline-Specific Elective	3
Technical Elective II	Discipline-Specific Elective	3
SDE 457	Senior Design I	3
SDE 458	Senior Design II	3

Courses Descriptions

General Education (18 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

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 introduces the principles and practices of project management, including project planning, scheduling, budgeting, and control. Topics include the origins and philosophy of project management, the use of tools such as Microsoft Project, and the application of the System Development Cycle to various project types. Emphasis is placed on project leadership, team building, and the management of resources and risks through illustrative case studies and practical exercises.Prerequisite(s): EN 101 and BUS 174.

Social Science Elective (3 credits): A university-approved elective course in the social sciences that supports an understanding of human behavior, social systems, or global dynamics. Options may include sociology, psychology, economics, or political science.

Mathematics and Science (30 credits)

MA 114 – Algebra and Trigonometry (4 credits): Designed for students needing mathematical preparation for Calculus I. Topics include basic operations on real and complex numbers, fractions, exponents, and radicals; determinants; and solutions of linear, fractional, quadratic, and system equations. Trigonometry topics include definitions and identities, angular measurement, solving triangles, vectors, graphs, and logarithmic functions. Prerequisite(s): MA 112 or placement test score.

MA 128 – Introduction to Statistics (3 credits): This course introduces students to fundamental concepts of statistics with practical applications. Topics include descriptive statistics, probability distributions, sampling methods, statistical inference, confidence intervals, hypothesis testing, correlation, and linear regression. Emphasis is placed on interpreting data, understanding variability, and applying statistical reasoning in real-world contexts. Prerequisite(s): MA 110, MA 111, or MA 112.

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 330 – Linear Algebra (3 credits): This course introduces the fundamental concepts of linear algebra with an emphasis on applications in engineering and science. Topics include systems of linear equations, matrices and matrix operations, determinants, vector spaces, basis and dimension, eigenvalues and eigenvectors, linear transformations, and orthogonality. Real-world applications are explored throughout to demonstrate the practical utility of linear algebra in solving engineering problems. **Prerequisite(s):** MA 261.

MA 340 - Ordinary Differential Equations (3 credits): This course addresses methods for solving first order equations with applications to mechanics and rate problems. It also covers solutions of second order equations

by undetermined coefficients and variations of parameters. Applications to circuits are also included as well as an introduction to systems of equations and operational and numerical methods. Prerequisite(s): MA 262

PH 201 – General Physics I (3 credits): This non-calculus-based physics course is designed for students in engineering technology programs. It focuses on mechanics, including units and conversion factors, vector diagrams, translational and rotational equilibrium, friction, uniformly accelerated motion, projectile motion, Newton's laws, work, energy and power, kinetic and potential energy, conservation of energy, and impulse and momentum. The course also introduces heat and thermodynamics, covering temperature scales, thermal properties of matter, heat and temperature change, phase change, and modes of heat transfer with practical applications. Prerequisite(s): MA 114.

PH 202 – General Physics II (3 credits): This non-calculus-based physics course is designed for students in engineering technology programs and serves as a continuation of PH 201. Topics include wave motion, sound, and light, with emphasis on reflection, refraction, dispersion, lenses, mirrors, and the Doppler Effect. The course also covers electricity and magnetism, including static electricity, electric and magnetic fields, electric potential, capacitance, electromagnetic induction, and alternating current behavior. Prerequisite(s): PH 201**.**

CH 120 – Chemistry (3 credits): Introduces fundamental concepts of chemistry including the metric system, significant figures, and stoichiometry. Covers atomic structure, periodic relationships, and electron configurations; chemical bonding and electronegativity; gases, oxidation-reduction reactions, solutions, acids and bases, states of matter, thermodynamics, and chemical kinetics and equilibrium. Prerequisite(s): MA 112 or MA 114.

Civil and Construction Engineering Core (48 Credits)

CM 120 – Introduction to Construction Management (3 Credits): Introduces students to the principles, practices, and organization of the construction industry. Topics include the history and evolution of construction, roles and responsibilities of project participants, project delivery methods, and the phases of construction management from planning to project closeout. Emphasis is placed on understanding construction contracts, scheduling, safety, and quality control, as well as the interaction among owners, designers, and contractors. Students gain an overview of career paths and management functions within the industry. Prerequisite(s): None.

CM 125 – Construction Graphing and Plan Reading (3 Credits): Introduces the principles and practices of reading and interpreting construction drawings. Emphasis is placed on understanding graphical communication, symbols, conventions, and the relationships among architectural, structural, mechanical, and electrical plans. Students learn to visualize construction processes, identify components, and interpret dimensions, sections, and details. The course provides a foundation for estimating, scheduling, and construction management applications. Prerequisite(s): CM 120 or FM 120.

CM 220 – Construction Methods and Materials (3 Credits): Examines the methods, materials, and technologies used in modern construction. Topics include properties, selection, and applications of common construction materials such as concrete, steel, masonry, wood, and composites. Emphasis is placed on vertical construction processes, design specifications, testing and inspection procedures, and

appropriate construction methodologies. The course also addresses sustainability, quality assurance, and emerging construction materials. Prerequisite(s): CM 120 or FM 120 and MA 114.

CM 250 – Legal Issues in Construction (3 Credits): Provides an overview of the legal principles and contractual relationships that govern the construction industry. Topics include standard forms of contracts, responsibilities and liabilities of owners, contractors, design professionals, and subcontractors, and legal aspects of bidding, changes, delays, claims, and dispute resolution. Emphasis is placed on contract interpretation, risk management, and the practical application of legal concepts from the general contractor's perspective. Prerequisite(s): CM 220.

CM 375 – Mechanical and Electrical Construction (3 Credits): Introduces the fundamental concepts of mechanical, electrical, plumbing, and fire protection (MEP) systems in building construction. Topics include system components, design intent, coordination, and installation practices. Students examine drawings and specifications to understand integration of MEP systems within structural and architectural frameworks. Emphasis is placed on construction methods, sequencing, and resource planning to ensure efficient and safe installation of building systems. Prerequisite(s): CM 220.

CM 380 – Environmental Systems (3 Credits): Provides a comprehensive overview of environmental considerations and impacts associated with construction processes. Topics include pollution prevention, waste management, air and water quality protection, and energy-efficient building systems. The course also examines environmental and occupational health hazards, regulatory compliance, and liability issues relevant to construction activities. Emphasis is placed on sustainable construction practices and integration of environmental management into project planning and execution. Prerequisite(s): CH 120, CM 120, CM 250, and PH 201.

CE 110 – Plane and Topographic Surveying (3 Credits): Introduces the principles and methods of land surveying and mapping for civil engineering applications. Topics include measurement of distance, elevation, and angles; traversing; leveling; topographic mapping; and error analysis. Students use total stations, levels, GPS, and other digital surveying instruments. Field and lab exercises emphasize data collection, map preparation, and introduction to GIS-based analysis. Prerequisite(s): MA 114 or equivalent.

CE 310 – Structural Analysis (3 Credits): Covers the analysis of determinate and indeterminate structures subjected to various loading conditions. Topics include static equilibrium, internal forces, influence lines, deflection of beams and trusses, and methods such as moment distribution and stiffness analysis. Computer-aided analysis tools are introduced to complement classical techniques. Emphasis is placed on understanding structural behavior and preparing students for advanced design courses. Prerequisite(s): MEC 255.

CE 315 – Design of Reinforced Concrete (3 Credits): Study of the behavior, analysis, and design of reinforced concrete structural elements in accordance with ACI standards. Topics include material properties, design of beams, slabs, columns, and footings for flexure, shear, and axial load. Emphasis is placed on load and resistance factor design (LRFD), detailing requirements, and serviceability criteria. Design projects integrate code compliance, constructability, and sustainability. Prerequisite(s): CE 310.

CE 320 – Steel Structure Analysis and Design (3 Credits): Examines the analysis and design of steel structures in accordance with AISC specifications. Topics include design of tension members, compression members, beams, beam-columns, and bolted and welded connections. Students apply both

ASD (Allowable Stress Design) and LRFD methods. The course incorporates modern CAD and structural modeling software to develop complete design documentation. Prerequisite(s): CE 310.

CE 330 – Geotechnical and Geological Engineering (3 Credits): Introduces soil mechanics and applied geology for civil engineering design. Topics include soil classification, compaction, permeability, seepage, consolidation, shear strength, and bearing capacity. Geological processes affecting site conditions, slope stability, and foundation design are also covered. Laboratory exercises involve soil sampling, testing, and interpretation of engineering properties. Prerequisite(s): MEC 255 and CH 120.

CE 350 – Transportation Engineering (3 Credits): Explores the planning, design, and operation of transportation systems with emphasis on highways and urban networks. Topics include geometric design, traffic flow theory, pavement design, intersection control, and safety analysis. Students apply AASHTO standards and traffic simulation tools in project-based work. Sustainability, environmental impacts, and smart transportation technologies are also discussed. Prerequisite(s): MA 262 and CE 110.

MEC 210 – Engineering Mechanics – Statics (3 credits): Introduces static equilibrium principles and their applications in engineering systems. Topics include force and moment analysis, centers of gravity, centroids, and moments of inertia. Uses engineering software tools for modeling and visualization. Prerequisite(s): MA 261. Corequisite(s): PH 261.

MEC 255 – Mechanics of Materials and Materials Science (3 credits): Covers the mechanical behavior of engineering materials and analysis of stresses, strains, and deformations in structural components under various loading conditions. Topics include axial loading, torsion, bending, shear, and material failure theories. Also introduces the fundamentals of materials science, including crystal structure, phase diagrams, heat treatment, and common failure mechanisms such as fatigue and fracture. Emphasizes applications in aerospace structural design and material selection. **Prerequisite(s):** MEC 210

MEC 310 – Engineering Mechanics – Dynamics (3 credits): Covers motion of particles and rigid bodies, Newton's laws, work-energy and impulse-momentum methods, and vibrations. Applies dynamic analysis to aerospace and mechanical systems using engineering modeling tools.

MEC 330 – Fluid Mechanics (3 credits): Continuum, velocity field, fluid statics, manometers, basic conservation laws for systems and control volumes, dimensional analysis. Euler and Bernoulli equations, viscous flows, boundary layers, flow in channels and around submerged bodies, one-dimensional gas dynamics, turbomachinery. Applications in hydraulic, pneumatic, and fluidics discussed. **Prerequisite(s):** MEC 310, MA 262.

Computing and Analytical Tools (9 Credits)

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.

DS 101 – Introduction to Data Science (3 Credits): Introduces the fundamental concepts, standards, and practices of data science for engineering and technology applications. Topics include data collection, organization, management, exploration, and visualization. Students learn to prepare, analyze, and interpret data using basic computational tools and techniques. Emphasis is placed on developing analytical thinking skills and applying data-driven decision-making to real-world problems. Corequisite(s): MA 112.

EL 100 – Introduction to DC/AC Circuits (3 credits): Introduces basic electrical concepts and laboratory techniques. Topics include current, voltage, resistance, and power; Ohm's Law; series and parallel resistive circuits; and Kirchhoff's voltage and current laws. Covers capacitors and inductors, charging and discharging, RC and RL time constants, and an introduction to AC signals including sinusoidal waveforms, phasors, reactance, and admittance. Laboratory work emphasizes the use of meters, testing equipment, and circuit breadboarding. MATLAB Part I introduces variables, functions, data types, programming, and basic plotting. Corequisite(s): MA 112.

Technical Electives and Capstone (15 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. Note: Course must be completed with a grade of "C" or higher to meet undergraduate graduation requirements. Prerequisite(s): SDE 457.

Technical Elective I – Discipline-Specific Elective (3 Credits): Provides students with the opportunity to explore specialized topics within civil and construction engineering. Elective options may include advanced study in structural, geotechnical, environmental, transportation, or construction management areas. Course selection should align with the student's professional interests and career goals, subject to advisor approval. Prerequisite(s): Junior standing or consent of the program advisor.

Technical Elective II – Discipline-Specific Elective (3 Credits): A continuation of discipline-specific study allowing students to broaden or deepen their expertise in a selected area of civil or construction engineering. Topics vary by semester and may include sustainable infrastructure design, advanced surveying, water resources, or emerging construction technologies. Prerequisite(s): Technical Elective I or advisor approval.

5. General Education Requirements

The Bachelor of Science in Civil Engineering fully satisfies the general education requirements as defined by the Maryland Higher Education Commission (MHEC) and the standards outlined in COMAR

13B.02.03. General education is integrated throughout the curriculum to ensure that students receive a comprehensive education that develops communication, ethical reasoning, critical thinking, and social responsibility.
The program includes 21 credits of general education coursework distributed across core knowledge areas. English composition requirements are fulfilled by EN 101 (English Communications I) and EN 102 (English Communications II). The arts and humanities requirement is met through HU 331 (Arts and Ideas), while the social and behavioral sciences requirements are satisfied by BUS 174 (Introduction to Business and Management), SS 351 (Ethics), and a Social Science Elective chosen by the student. Quantitative reasoning and natural science competencies are addressed through required courses in mathematics (Calculus I–II, Linear Algebra, Differential Equations, Statistics) and basic sciences (Physics I–II and Chemistry), which collectively exceed MHEC's expectations for analytical, quantitative, and scientific literacy. This integrated structure ensures that graduates possess the intellectual breadth, ethical grounding, and communication skills required for effective civil engineering practice and responsible citizenship.

6. Specialized Accreditation and Licensure
As with other engineering programs at Capitol Technology University, the Bachelor of Science in Civil Engineering will seek accreditation through the Engineering Accreditation Commission (EAC) of the Accreditation Board for Engineering and Technology (ABET).
The curriculum is designed in full alignment with ABET's *Criteria for Accrediting Engineering Programs*, particularly Criterion 5: Curriculum, which requires:

- At least one year of college-level mathematics and basic sciences appropriate to the discipline, including experimental experience.
- At least one and one-half years of engineering topics consisting of engineering sciences and design, emphasizing both analysis and synthesis appropriate to civil engineering practice.

The Civil Engineering curriculum includes:

- Mathematics: through differential equations, statistics, and linear algebra (MA 261, MA 262, MA 340, MA 128, MA 330).
- Basic Sciences: including chemistry and a full sequence of calculus-based physics (CH 120, PH 201, PH 202).
- Engineering Topics: more than 45 credits in civil and construction engineering, including statics, materials, fluid mechanics, structural analysis, surveying, and transportation engineering.
- Capstone Design: a two-semester senior design sequence (SDE 457 and SDE 458) integrating engineering design, ethics, sustainability, and project management.

The program meets all ABET curricular and outcome standards. Following standard procedures, Capitol Technology University will apply for EAC-ABET accreditation review after the first cohort of students graduates. Once accredited, graduates will be eligible to pursue Professional Engineer (PE) licensure in Maryland and other states recognizing EAC-ABET-accredited degrees.

7. Contractual Agreements
This program does not involve any contractual agreements with other institutions or non-collegiate organizations. All instruction, academic oversight, and student services for the Bachelor of Science in Civil Engineering will be delivered directly by Capitol Technology University using existing faculty, laboratories, and administrative resources.

8. Student Information, Advising, and Academic Support
Capitol Technology University affirms that all students enrolled in the B.S. in Civil Engineering program will receive comprehensive and timely information regarding curriculum requirements, technology expectations, and academic resources. This information will be disseminated through the following mechanisms:

- The complete curriculum, course descriptions, and degree requirements will be published in the academic catalog and on the official university website. These materials are reviewed annually by the Office of Academic Affairs to ensure accuracy and compliance with accreditation standards.
- Each student will be assigned a faculty advisor upon enrollment to provide degree planning, course sequencing guidance, and mentorship through to graduation.
- Course syllabi will specify expectations for attendance, assignments, assessment methods, grading policies, and communication, including faculty office hours and contact information.
- Students will receive information about required software (AutoCAD Civil 3D, MATLAB, Microsoft Project, etc.) and technology competencies during orientation and within course syllabi. Minimum hardware and software specifications are maintained on the university website and supported by the Office of Information Technology.
- The Canvas Learning Management System will be used to deliver course materials, manage assignments, and facilitate communication between students and faculty. Training is provided at orientation and throughout the semester.
- Comprehensive academic support services—including tutoring, library access, writing assistance, and career development—are available to all students. These services are described in the student handbook and on the university website.
- The Financial Aid and Business Offices provide transparent information about tuition, fees, payment options, scholarships, and veteran or military benefits.

These measures ensure that all Civil Engineering students receive clear, complete, and timely information about program expectations and available resources, enabling them to succeed academically and professionally.

8. Accuracy of Advertising, Recruiting, and Admissions Materials

Capitol Technology University ensures that all advertising, recruitment, and admissions materials for the Bachelor of Science in Civil Engineering accurately reflect the program's curriculum, learning outcomes, and available resources.

The Office of Marketing and Communications, in collaboration with the Office of Admissions and the School of Engineering, maintains oversight of all promotional content to ensure it is:

- Factually correct, transparent, and aligned with approved curricular documents.
- Consistent with the university's mission and accreditation requirements.
- Updated regularly to reflect any programmatic or policy changes.

Public-facing information—available through brochures, the university website, social media, and recruitment presentations—will clearly communicate:

- Degree requirements, total credits, and course structure.
- Program objectives, ABET-aligned learning outcomes, and professional licensure pathways.
- Laboratory, fieldwork, and technology expectations.
- Faculty advising, student support services, and career development opportunities.
- Tuition, fees, and financial aid options.

Admissions staff and faculty advisors will receive program-specific orientation to ensure consistent and accurate communication during open houses, community college visits, and information sessions. These efforts collectively guarantee that all promotional and recruitment materials accurately represent the B.S. in Civil Engineering program and the high-quality educational experience provided by Capitol Technology University.

H. Adequacy of Articulation

1. Articulation and Transfer Pathways

The Bachelor of Science in Civil Engineering at Capitol Technology University is designed to support strong articulation and transfer pathways with Maryland's community colleges and partner institutions. The program aligns with statewide efforts to create seamless transfer opportunities for students completing associate degrees in engineering, civil engineering technology, or construction management. Capitol Technology University currently maintains formal articulation agreements with institutions including Anne Arundel Community College, Howard Community College, Cecil College, and Montgomery College, all of which offer lower-division engineering or pre-engineering curricula. These agreements enable students to transfer foundational coursework—such as Calculus I–II, Physics, Chemistry, Statics, and Engineering Graphics—directly into the B.S. in Civil Engineering program with minimal loss of credit.

The curriculum was intentionally designed to mirror the common engineering transfer framework adopted by the Maryland Higher Education Commission (MHEC) and to ensure full alignment with EAC-ABET standards in mathematics, science, and engineering topics. Students completing an associate degree in related disciplines can expect to transfer approximately 60 credits toward the 120-credit bachelor's degree, allowing for degree completion in two additional years of full-time study.

Capitol Technology University also participates in statewide STEM articulation initiatives and maintains partnerships beyond Maryland, including with the Community College of Rhode Island (CCRI) and Columbia Southern University, to facilitate national mobility for transfer students pursuing civil and construction-related fields.

In addition, the university supports early pipeline programs through Project Lead The Way (PLTW) and serves as an industry and academic partner for Prince George's County Public Schools (PGCPS) PLTW Engineering Program Advisory Committee. These collaborations introduce high-school students to surveying, sustainability, and construction technology, providing early exposure to civil-engineering career paths.

Capitol Technology University will continue to expand articulation partnerships with additional Maryland community colleges offering Engineering (AS), Civil Engineering Technology (AAS), and Construction Management (AAS) programs. Formal 2+2 articulation agreements specific to the B.S. in Civil Engineering will be finalized and submitted as supporting materials following MHEC program approval.

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 Civil Engineering will be supported by a highly qualified and experienced faculty team composed of full-time professors, professors of practice, and adjunct instructors. Together, these faculty members bring expertise in civil, mechanical, electrical, and systems engineering, as well as applied computing and project management. Their combined experience ensures that students receive both rigorous academic instruction and practical, industry-oriented training.

Faculty teaching in the program hold terminal degrees in engineering, computer science, and related disciplines, and have extensive experience in applied research, curriculum development, and industry collaboration.

Full-Time Faculty

Dr. Mohamed Shehata, Dean of Academics and Chair of the Engineering Department, holds a Ph.D. in Engineering from Purdue University. His doctoral research focused on power electronics and electric drive systems. He oversees 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. He brings decades of teaching experience and industry engagement, offering courses in analog and digital systems, communications, and signal processing.

Dr. Andrew Mehri holds a Ph.D. in Computer Science and degrees in information architecture and electronics engineering. He has served in academic leadership roles and teaches courses in electronics, digital systems, and technical systems design.

Dr. Najam Ul Hassan, Chair of the Computer and Data Science Department, holds a Ph.D. in Business Analytics and Decision Sciences, with additional advanced degrees in computer science and management. He teaches project management, analytics, and supports interdisciplinary curriculum integration.

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.

Dr. Jeff Chi holds a Ph.D. in Project Management from the University of Maryland. His professional background includes large-scale construction, environmental sustainability, and infrastructure projects. He teaches project management and engineering leadership.

Dr. Gregory P. Behrmann, Professor of Civil Engineering, earned a Ph.D. in Civil Engineering from The Catholic University of America. His background includes applied research in micro-manufacturing, K–12 STEM outreach, and engineering education. He teaches courses in statics, dynamics, materials, thermodynamics, and senior design.

Ms. Amelia Wear, Instructor of Civil Engineering, holds a B.S. in Civil Engineering and an M.S. in Software Engineering. She is a Lead Systems Engineer at Wabtec, bringing experience in control systems, integration, and agile design. She teaches courses in mechatronics, systems design, and applied modeling.

Dr. Nisma M. Omar, Adjunct Professor, earned a Ph.D. in Analytical Chemistry and an M.S. in Physical Chemistry. She teaches foundational science and mathematics courses, contributing to laboratory instruction and academic preparation for engineering students.

Adjunct Faculty

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. She teaches composition and technical writing courses supporting communication skills in engineering education.
Together, this faculty team provides the expertise necessary to deliver a high-quality, ABET-aligned Civil Engineering curriculum that integrates theory, experimentation, and applied design.

Dr. Edwige F. Songong, Adjunct Faculty, holds a Ph.D. in Civil Engineering from the University of Cape Town, along with M.S. degrees in Technology Management, Mathematical Sciences, and Physics. Her research interests include structural dynamics, sustainability, and engineering education. She has taught structural analysis and physics for engineers and contributes to instruction in math, physics, and structural systems within the Applied Engineering program.

Dr. Nick Coleman, P.E., PMP – Civil engineer and project manager with 20 years of experience overseeing $1.8B in transportation and infrastructure projects across Federal, State, and local levels. Founder of Coastline Rail Engineering and expert in project management, bridge design, and construction engineering. Holds a DBA in Project Management, M.S. in Project Management, and B.S. in Civil Engineering Technology; licensed in multiple states.

Faculty Teaching Assignment Table

Course	Faculty
BUS 174	Dr. Jeff Chi
BUS 301	Dr. Jeff Chi
CE 110	Dr. Gregory P. Behrmann
CE 310	Dr. Gregory P. Behrmann
CE 315	Dr. Edwige Songong
CE 320	Dr. Edwige Songong
CE 330	Dr. Edwige Songong
CE 350	Dr. Edwige Songong
CH 120	Dr. Nisma Omar
CM 120	Dr. Jeff Chi
CM 125	Dr. Edwige Songong
CM 220	Dr. Nick Coleman
CM 250	Dr. Nick Coleman
CM 375	Dr. Jeff Chi
CM 380	Dr. Nick Coleman
CS 120	Dr. Najam Hassan
DS 101	Dr. Kellep Charles
EL 100	Dr. Amelia Wear
EN 102	Ms. Megan Miskovish

Course	Faculty
HU 331	Ms. Megan Miskovish
MA 114	Dr. Nisma Omar
MA 128	Dr. Andrew Mehri
MA 261	Dr. Charles Conner
MA 262	Dr. Charles Conner
MA 330	Dr. Andrew Mehri
MA 340	Dr. Charles Conner
MEC 210	Dr. Mohamed Shehata
MEC 255	Dr. Gregory P. Behrmann
MEC 310	Dr. Mohamed Shehata
MEC 330	Dr. Gregory P. Behrmann
PH 201	Dr. Mohamed Shehata
PH 202	Dr. Charles Conner
SDE 457	Dr. Andrew Mehri
SDE 458	Dr. Nick Coleman
SS Elective	Ms. Megan Miskovish
SS 351	Ms. Megan Miskovish
EN 101	Ms. Megan Miskovish

2. Ongoing Pedagogy Training for Faculty

Capitol Technology University is committed to ensuring that faculty teaching in the Bachelor of Science in Civil Engineering program receive ongoing professional development in evidence-based

instructional practices and the effective use of educational technologies. The university's Center for Innovation in Teaching and Learning (CITL) serves as the central resource for faculty development, providing structured training, workshops, and consultations that promote excellence in teaching and learning.

a) Pedagogy that Meets the Needs of Students

All new and continuing faculty participate in regular training focused on student-centered learning, inclusive pedagogy, and active engagement techniques. Sessions emphasize strategies that address the diverse needs of Capitol's student population, which includes first-generation college students, adult learners, transfer students, and underrepresented groups in STEM disciplines.

Faculty are encouraged to incorporate project-based learning, case studies, team-based design projects, and formative assessment methods to enhance critical thinking and problem-solving in civil engineering contexts. The CITL also provides individualized consultations and peer observations to support continuous instructional improvement and the integration of innovative teaching practices within civil-engineering courses.

b) Learning Management System (LMS)

Capitol Technology University utilizes **Canvas** as its institutional learning management system. All faculty members are trained during onboarding to develop, organize, and manage course materials in Canvas. Ongoing workshops and tutorials are offered on effective use of integrated tools such as rubrics, online gradebooks, analytics dashboards, discussion forums, and course modules.

Advanced sessions provide guidance on using Canvas for **hybrid and technology-enhanced instruction**, ensuring timely feedback and consistent communication between faculty and students in both lecture and laboratory settings.

c) Evidence-Based Best Practices for Distance Education

Not Applicable.

The B.S. in Civil Engineering program will be delivered primarily in a face-to-face, on-campus format. Selected general education and supporting technical courses may be offered in hybrid or online formats for flexibility, but the core civil-engineering curriculum will rely on hands-on, laboratory-based, and field-based instruction consistent with ABET expectations for experiential learning.

J. Adequacy of Library Resources

1. Library Resources and Access

Capitol Technology University's Puente Library provides comprehensive academic and technical support for students and faculty in the Bachelor of Science in Civil Engineering program. The library maintains a robust collection of physical and digital resources that directly support coursework and research in civil, structural, transportation, geotechnical, and environmental engineering, as well as construction management and sustainability.

Students and faculty have full-text access to premier academic and professional databases, including:

- ASCE Library (American Society of Civil Engineers): Access to leading journals, conference proceedings, standards, and case studies in structural, geotechnical, transportation, and environmental engineering.
- ScienceDirect and SpringerLink: Extensive coverage of materials science, fluid mechanics, surveying technologies, construction methods, and environmental systems.

- IEEE Xplore: Publications related to control systems, instrumentation, and emerging technologies in smart infrastructure and digital civil engineering.
- Engineering Village (Compendex and Inspec): Comprehensive indexing of engineering research, including structural design, materials testing, and sustainable infrastructure.
- ProQuest and JSTOR: Peer-reviewed literature on construction management, ethics, economics, and urban development policy.
- SAE Mobilus and ASTM Compass: Access to engineering standards and technical specifications relevant to materials testing and construction safety.

The library's holdings also include key professional resources such as AASHTO standards, FHWA technical manuals, building codes (IBC, IRC), and environmental regulations (EPA and NEPA references) that directly support student coursework, laboratories, and design projects.

2. Instructional Support and Research Assistance

The Puente Library offers individualized support to both students and faculty in research, information literacy, and technical writing. Librarians provide instruction on effective database search strategies, use of citation management tools (such as RefWorks and EndNote), and ethical research and citation practices.

Library staff collaborate with the School of Engineering to deliver research workshops tailored to senior design projects, literature reviews, and technical report preparation. Through interlibrary loan and digital resource-sharing agreements, students can access specialized civil-engineering literature from partner institutions and national repositories.

3. Program-Specific Resource Development

To ensure the Civil Engineering program remains current and well-supported, the following strategies will be implemented:

- Targeted acquisitions: The library will work with civil-engineering faculty to acquire updated materials on surveying, structural analysis, geotechnical design, fluid mechanics, transportation systems, and sustainable infrastructure.
- Annual reviews: Library holdings will be reviewed each year to maintain alignment with program outcomes, ABET accreditation requirements, and evolving industry standards.
- Faculty collaboration: Faculty will be encouraged to recommend new resources to support senior design projects, construction management case studies, and applied research initiatives in environmental and transportation systems.

These processes ensure continuous alignment between library resources and the evolving academic and professional needs of the program.

4. Digital and Remote Access

All major library databases, e-books, standards, and journals are available online through the Puente Library Portal and integrated into the Canvas Learning Management System. This ensures that both on-campus and hybrid learners have uninterrupted access to engineering resources at any time. Remote authentication allows students to access materials from any location, supporting the applied, project-based nature of the Civil Engineering curriculum. Through these digital resources, students can effectively engage in design research, technical documentation, and professional development consistent with industry and ABET standards.

K. Adequacy of Physical Facilities, Infrastructure, and Instructional Equipment

1. Classroom, Office, and Laboratory Space

Capitol Technology University affirms that it has the necessary physical and instructional infrastructure to support the successful implementation and long-term operation of the Bachelor of Science in Civil Engineering program. Instruction will be conducted in modern, multimedia-equipped classrooms featuring projectors, smartboards, wireless internet connectivity, and hybrid technology that supports both in-person and remote learners.

Faculty supporting the program have access to dedicated or shared office spaces for student advising, research consultation, and administrative responsibilities. The Office of Academic Affairs reviews office and classroom allocations annually to ensure sufficient capacity and proper alignment with enrollment growth.

Hands-on learning and applied design experiences in surveying, structural analysis, and construction management will be supported through the university's existing engineering and technology laboratories, which will also serve Civil Engineering students. These include:

- Engineering Mechanics and Materials Lab: Supports instruction in statics, dynamics, and materials testing using tension, compression, and bending apparatus; includes strain gauges, deflection measurement tools, and mechanical testing systems.
- Fluid Mechanics and Environmental Systems Lab: Equipped with hydraulic benches, flow meters, pumps, and sensors for studying open-channel and pipe flow, hydrostatics, and environmental fluid behavior.
- Construction and Project Management Lab: Provides students with access to construction estimation, scheduling, and project management software such as AutoCAD Civil 3D, Microsoft Project, and Primavera P6, supporting instruction in CM 220, CM 250, and CM 380.
- Surveying and Geomatics Lab: Includes total stations, theodolites, GPS survey receivers, and leveling instruments for fieldwork in CE 110 (Plane and Topographic Surveying) and related courses.
- Civil Engineering Design and CAD Lab: Offers computer workstations with AutoCAD, Revit, MATLAB, STAAD.Pro, and GIS applications for structural and site design projects.
- Capstone and Design Project Space: Dedicated workspace for students in SDE 457 and SDE 458, providing collaborative environments and access to prototyping tools for interdisciplinary and infrastructure design projects.

All laboratories are maintained according to safety and operational standards, including appropriate signage, personal protective equipment (PPE), emergency protocols, and regular calibration and inspection of equipment. These facilities fully support the program's emphasis on applied learning, sustainability, and design within the civil and construction-engineering disciplines.

2. Support for Distance Education Students and Faculty

Although the Civil Engineering program will be offered primarily in an on-campus format, Capitol Technology University maintains a robust digital infrastructure that supports hybrid and online course components for general education and analytical courses.

a) Institutional Email System

All students and faculty are issued official university email accounts through Microsoft Office 365, ensuring secure communication and integrated access to cloud-based tools such as OneDrive, Teams, and SharePoint for document collaboration and remote coordination.

b) Learning Management System (LMS)

The university uses Canvas as its learning management system to support the delivery of course materials and facilitate hybrid learning. Canvas enables:

- Asynchronous and synchronous access to course content and recorded lectures

- Online submission of assignments, design reports, and laboratory documentation
- Integration with Zoom, Turnitin, and Microsoft Office tools for communication and assessment
- Real-time progress tracking and feedback through the online gradebook and analytics dashboard
- 24/7 technical support and ongoing training for faculty and students

All faculty receive initial and ongoing training on Canvas through the Center for Innovation in Teaching and Learning (CITL). This infrastructure ensures that students—whether full-time, transfer, or adult learners—have continuous access to academic resources, collaboration tools, and course content necessary for success in civil-engineering study.

L. Adequacy of Financial Resources with Documentation

1. Program Resources

The **Bachelor of Science in Civil Engineering** will be implemented using existing university resources, including classrooms, laboratory facilities, computing infrastructure, library holdings, and qualified faculty within the School of Engineering. The program builds on established strengths in applied engineering, construction management, and project-based instruction. No existing programs will be reduced or restructured to accommodate this offering.

Table 1: Program Resources

Resource Category	Year 1	Year 2	Year 3	Year 4	Year 5
1. Reallocated Funds	$0	$0	$0	$0	$0
2. Tuition and Fee Revenue (c + g)	$372,000	$763,000	$1,164,000	$1,580,000	$2,005,000
a. Number of Full-Time Students	8	16	24	32	40
b. Annual Tuition/Fee Rate	$28,000	$28,700	$29,400	$30,100	$30,800
c. Total Full-Time Revenue (a × b)	$224,000	$459,200	$705,600	$963,200	$1,232,000
d. Number of Part-Time Students	8	13	18	23	28
e. Credit Hour Rate	$1,500	$1,540	$1,580	$1,620	$1,660
f. Annual Credit Hours per Part-Time Student	13	13	13	13	13
g. Total Part-Time Revenue (d × e × f)	$148,000	$303,800	$458,400	$616,800	$773,000
3. Grants, Contracts, and Other Sources	$0	$0	$0	$0	$0
4. Other Sources	$0	$0	$0	$0	$0
TOTAL (1–4)	**$372,000**	**$763,000**	**$1,164,000**	**$1,580,000**	**$2,005,000**

Narrative Rationale – Table 1:

- No internal reallocation is required; the program leverages existing engineering laboratories, classrooms, and faculty resources.
- Revenue projections assume moderate enrollment growth over five years, with proportional tuition adjustments.
- The estimates include both full-time and part-time students averaging 13 credit hours per academic year.
- The program will explore future funding opportunities related to infrastructure innovation, sustainability, and construction technology through state and federal grants.
- No additional revenue sources are required at launch.

2. Program Expenditures

Table 2: Program Expenditures

Expenditure Category	Year 1	Year 2	Year 3	Year 4	Year 5
1. Faculty (b + c)	$125,000	$190,000	$265,000	$345,000	$430,000
a. FTE Faculty	2.0	3.0	4.0	5.0	6.0
b. Faculty Salaries	$104,000	$158,000	$220,000	$286,000	$356,000
c. Faculty Benefits (20%)	$21,000	$32,000	$45,000	$59,000	$74,000
2. Administrative Staff (b + c)	$6,200	$6,400	$6,600	$6,800	$7,000
a. FTE Admin Staff	0.10	0.10	0.10	0.10	0.10
b. Admin Salaries	$5,200	$5,400	$5,600	$5,800	$6,000
c. Admin Benefits (20%)	$1,000	$1,000	$1,000	$1,000	$1,000
3. Support Staff (b + c)	$60,000	$85,000	$110,000	$135,000	$160,000
a. FTE Support Staff	1.0	1.5	2.0	2.5	3.0
b. Support Salaries	$50,000	$70,800	$91,600	$112,500	$133,300
c. Support Benefits (20%)	$10,000	$14,200	$18,400	$22,500	$26,700
4. Technical Support and Equipment	$4,000	$6,000	$8,000	$10,000	$12,000
5. Library	$0	$0	$0	$0	$0
6. New or Renovated Space	$0	$0	$0	$0	$0
7. Other Expenses	$8,000	$14,000	$22,000	$30,000	$40,000
TOTAL (1–7)	**$203,200**	**$301,400**	**$411,600**	**$536,800**	**$649,000**

Narrative Rationale – Table 2:

- Faculty: Gradual increase in FTEs to support growth in civil, structural, geotechnical, and construction-management courses. Salaries include fringe benefits at 20%.
- Administrative Staff: Allocation supports program coordination, advising, and enrollment tracking.
- Support Staff: Includes laboratory assistants and field technicians to support surveying, materials testing, and environmental systems labs.
- Technical Support and Equipment: Covers surveying instruments (total stations, GPS units, leveling devices), materials testing apparatus, hydraulic benches, and civil-engineering design software (AutoCAD Civil 3D, MATLAB, STAAD.Pro, GIS).
- Library: No additional funds required; existing digital and technical collections (ASCE, IEEE, ScienceDirect) already meet program needs.
- New or Renovated Space: Not required; existing laboratories and classroom infrastructure are sufficient.
- Other Expenses: Includes capstone project materials, safety equipment (PPE, lab gear), professional organization memberships (ASCE student chapter), and program outreach.

The projected revenues are sufficient to sustain program operations by Year 3, ensuring that the B.S. in Civil Engineering program remains financially self-supporting while maintaining high academic quality and applied learning opportunities.

M. Adequacy of Provisions for Evaluation of Program

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

Capitol Technology University maintains a comprehensive and structured system for evaluating courses, faculty performance, and student learning outcomes in alignment with institutional assessment policies and **EAC-ABET accreditation standards**.

Each course within the **Civil Engineering** program is evaluated at the end of each semester through standardized student surveys that assess instructional quality, course organization, engagement, and relevance of course content to stated learning outcomes. The results are reviewed by program faculty, the Department Chair, and the Dean of Academic Affairs to support continuous improvement in instruction and curriculum design.

Faculty performance is evaluated through multiple mechanisms, including:

- **Student course evaluations** conducted each term;
- **Peer observations** of teaching and classroom management;
- **Annual performance reviews** conducted by the Dean and academic leadership to assess effectiveness in teaching, advising, scholarship, and service.

Student Learning Outcomes (SLOs) are systematically assessed at both the **course** and **program** levels. Designated faculty collect representative student work—such as laboratory reports, design projects, written assignments, and oral presentations—and evaluate them using standardized rubrics aligned with **ABET Student Outcomes (1–7)**. These data are compiled into annual assessment reports that inform departmental review meetings and continuous program improvement efforts.

2. Evaluation of Program Educational Effectiveness

The **Bachelor of Science in Civil Engineering** will be evaluated through a comprehensive framework that measures educational effectiveness, student success, and relevance to Maryland's civil and construction-engineering workforce.

Key elements of this evaluation framework include:

- **Assessment of Student Learning Outcomes**
  Student achievement will be evaluated across fundamental areas such as structural analysis, surveying, geotechnical and environmental systems, and project management. Assessment methods include exams, laboratory reports, design portfolios, technical presentations, and the two-semester **senior design capstone** sequence (SDE 457 and SDE 458). Annual outcome reviews will identify trends in student performance and guide curriculum refinement.
- **Retention and Graduation Metrics**
  The Office of Institutional Research monitors student retention, graduation rates, and post-graduation employment data. Trends are analyzed to identify and address factors affecting student persistence and completion, ensuring timely academic progression and degree attainment.
- **Student and Faculty Satisfaction**
  Annual surveys are administered to collect feedback from students and faculty on instructional quality, advising effectiveness, laboratory facilities, and overall program satisfaction. Focus groups and departmental meetings are used to discuss results and implement responsive improvements to teaching, lab access, and student engagement.
- **Cost-Effectiveness and Resource Utilization**
  The Division of Business and Finance, in coordination with the Office of Academic Affairs, conducts annual reviews of enrollment, instructional expenditures, and laboratory utilization to ensure the program remains financially sustainable while maintaining academic quality and student support.
- **Advisory Board and Industry Input**
  A **Civil and Construction Engineering Advisory Board** composed of industry professionals, faculty, and alumni will meet regularly to review curriculum alignment with professional practice and emerging industry trends. Board recommendations help ensure that the program continues to meet ABET standards and responds effectively to developments in **infrastructure design, sustainability, construction methods, and transportation systems**.

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

1. Access and Success for Minority Students

The Bachelor of Science in Civil Engineering supports the goals of the Maryland State Plan for Postsecondary Education, specifically those related to increasing access, advancing equity, and ensuring student success in high-demand STEM disciplines. The program is designed to provide inclusive, practice-oriented educational pathways into careers in infrastructure design, construction management, environmental systems, and transportation engineering—fields where minority representation remains limited both statewide and nationally.

Capitol Technology University has a longstanding commitment to diversity, equity, and inclusion across all academic programs. The Civil Engineering program builds upon this commitment by combining accessible instruction, applied learning, and targeted academic support to attract and retain students from historically underrepresented backgrounds in engineering.

Key strategies that promote minority student access and achievement include:

- Transfer Pathways and Articulation Agreements
  The program is structured to align with existing articulation agreements between Capitol Technology University and Maryland community colleges such as Prince George's Community College, Anne Arundel Community College, and Montgomery College, which serve large populations of minority and first-generation students. These agreements facilitate seamless transfer into the upper-division civil-engineering curriculum, reducing duplication of coursework and financial burden.
- Hands-On Curriculum and Industry Engagement
  The curriculum emphasizes project-based learning and real-world applications in surveying, construction, and environmental systems. This approach provides students—especially those from diverse academic backgrounds—with tangible learning experiences and early exposure to professional practice, increasing engagement and persistence.
- Advising and Academic Support
  Civil Engineering students receive individualized advising, academic progress monitoring, and access to tutoring and writing assistance. Faculty advisors and the Office of Student Success provide mentorship designed to help students navigate both academic and professional challenges, promoting consistent progress toward graduation.
- Financial Accessibility
  Capitol Technology University offers a range of financial aid and scholarship programs, including awards dedicated to underrepresented minorities in STEM fields. Students may also qualify for state-based aid programs, such as the Guaranteed Access Grant and Near Completer Grant, which help reduce economic barriers to participation and completion.
- Inclusive Campus Climate
  The university fosters a welcoming and inclusive campus culture through student organizations, multicultural programming, and equity-centered policies. Faculty are encouraged to apply inclusive pedagogy and culturally responsive teaching methods to ensure that all students—regardless of background—feel supported and valued within the engineering community.

Through these initiatives, the Bachelor of Science in Civil Engineering directly contributes to Goal 1 (Access) and Goal 2 (Success) of the 2022 Maryland State Plan for Postsecondary Education by expanding equitable opportunities for underrepresented populations in STEM and preparing them for leadership roles in Maryland's infrastructure, construction, and environmental sectors.

O. Relationship to Low Productivity Programs Identified by the Commission

1. Reallocation of Resources from Low Productivity Programs

The proposed **Bachelor of Science in Civil Engineering** is not a redesign, merger, or continuation of any program currently identified by the **Maryland Higher Education Commission (MHEC)** as low productivity. Rather, the program represents a strategic addition to Capitol Technology University's growing portfolio of civil engineering degrees designed to meet statewide workforce demand while ensuring efficient utilization of existing institutional resources.

The Civil Engineering program has been developed as part of the University's broader academic planning initiative to align degree offerings with **Maryland's infrastructure development, construction, and sustainability needs**. It leverages shared faculty expertise, existing laboratories, and instructional spaces already supporting mechanical, electrical, and construction management programs. This ensures high academic quality with minimal additional investment.

Key areas of resource alignment include:

- **Faculty Reassignment and Shared Expertise**
  Faculty with academic and professional backgrounds in **structural engineering, construction management, materials science, and environmental systems** will support instruction in the Civil Engineering curriculum. These faculty members currently teach in related disciplines within the School of Engineering and will extend their expertise to cover foundational and upper-division civil courses such as statics, materials, and geotechnical engineering.
- **Utilization of Existing Infrastructure**
  The program will make full use of existing **engineering and construction laboratories**, including facilities equipped for materials testing, surveying, hydraulics, and environmental systems. No additional laboratory space is required at launch, and all classroom and computing infrastructure—such as **AutoCAD Civil 3D, MATLAB, and GIS software**—is already available and maintained by the University.
- **Curricular Efficiency and Market Responsiveness**
  The Civil Engineering curriculum integrates **applied mechanics, environmental systems, construction technology, and project management**, ensuring that graduates are well-prepared for careers in both traditional infrastructure roles and emerging areas such as **sustainable construction and smart city systems**. This interdisciplinary structure promotes curricular efficiency and supports high enrollment potential compared to more narrowly specialized programs.

While the **Civil Engineering** program does not replace a currently low-producing program, it demonstrates Capitol Technology University's commitment to **continuous academic realignment and resource optimization**. The program's applied, practice-based design directly responds to regional and national workforce needs in **infrastructure, transportation, construction, and environmental sustainability**, ensuring long-term viability and alignment with institutional and state priorities.

P. Adequacy of Distance Education Programs

1. Institutional Eligibility to Offer 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 disciplines including engineering, technology, computer science, and business. Capitol Technology University is also an active participant in the National Council for

State Authorization Reciprocity Agreements (NC-SARA), which authorizes the institution to provide distance education to students residing in other SARA member states.
This authorization and active participation demonstrate the University's compliance with both state and national standards governing the design, delivery, and assessment of high-quality distance education programs.

2. Compliance with C-RAC Guidelines

Capitol Technology University adheres to the Interregional Guidelines for the Evaluation of Distance Education established by the Council of Regional Accrediting Commissions (C-RAC). The University affirms its full compliance with these standards through the following practices:

- Academic Quality and Rigor
  All distance and hybrid courses maintain the same academic quality, rigor, and learning outcomes as their on-campus counterparts. Course syllabi, assignments, and assessments are reviewed regularly to ensure alignment with program goals and ABET accreditation standards.
- Faculty–Student Interaction
  The University ensures regular and substantive interaction between faculty and students through synchronous virtual meetings, discussion forums, collaborative design projects, and timely feedback on assignments. Faculty maintain active communication and mentorship with students to foster engagement and academic success.
- Student Identity Verification
  Student identity is verified through secure login credentials within the Canvas learning management system (LMS). Proctored assessments and multi-factor authentication are implemented where appropriate to ensure academic integrity and compliance with institutional policy.
- Access to Student Services
  Students enrolled in online or hybrid courses have full access to all university support services, including academic advising, tutoring, library resources, writing support, and IT assistance. These services are delivered via online platforms supported by professional staff trained in remote student engagement.
- Technology Infrastructure
  The University's Canvas LMS provides a robust digital environment for course delivery, assessment, and communication. The system integrates tools such as Zoom, Turnitin, and Office 365 for document collaboration and virtual instruction. Faculty and students receive dedicated training and 24/7 technical support to ensure effective use of the technology.
- Faculty Training and Support
  All faculty teaching online or hybrid courses receive structured training in instructional design, online pedagogy, and digital classroom management. The Center for Innovation in Teaching and Learning (CITL) provides ongoing professional development, workshops, and one-on-one instructional design consultations to support effective online course delivery.

While the Bachelor of Science in Civil Engineering is primarily designed for in-person delivery to support its laboratory and design components—including surveying, materials testing, and structural analysis—several general education, mathematics, and project management courses may be offered in hybrid or online formats. All online components will fully comply with Capitol Technology University's distance education policies and the C-RAC guidelines, ensuring academic quality, integrity, and student engagement consistent with the standards applied to all on-campus programs.