



Provost and Senior Vice President for Academic Affairs

May 16, 2022

The Honorable Dr. James D. Fielder, Jr.
Maryland Higher Education Commission
6 N. Liberty Street, 10th Floor
Baltimore, MD 21201

Dear Dr. Fielder,

On behalf of Morgan State University, please find attached a proposal to establish a new Academic Program, the *Bachelor of Science in Sustainable Urban Environmental Engineering* in the School of Engineering. This proposed Academic Program was approved by the Board of Regents on May 3, 2022. If additional information is required, please contact me at hongtao.yu@morgan.edu or (443)885-3350.

Sincerely,

Hongtao Yu, PhD
Provost and Senior Vice President for Academic Affairs, Morgan State University

cc: Dr. David Wilson, President, Morgan State University
Dr. Phyllis Keys, Interim Associate Vice President for Academic Affairs, MSU
Dr. Oscar Barton, Dean, School of Engineering, MSU
Dr. Emily Dow, Assistant Secretary for Academic Affairs, Maryland Higher Education Commission



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

Institution Submitting Proposal	Morgan State University
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Each action below requires a separate proposal and cover sheet.

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|---|---|
| <input checked="" type="radio"/> New Academic Program | <input type="radio"/> Substantial Change to a Degree Program |
| <input type="radio"/> New Area of Concentration | <input type="radio"/> Substantial Change to an Area of Concentration |
| <input type="radio"/> New Degree Level Approval | <input type="radio"/> Substantial Change to a Certificate Program |
| <input type="radio"/> New Stand-Alone Certificate | <input type="radio"/> Cooperative Degree Program |
| <input type="radio"/> Off Campus Program | <input type="radio"/> Offer Program at Regional Higher Education Center |

Payment <input checked="" type="radio"/> Yes	Payment <input checked="" type="radio"/> R*STARS #	Payment Amount: \$850	Date Submitted: 5/15/22
Submitted: <input type="radio"/> No	Type: <input type="radio"/> Check #		

Department Proposing Program	School of Engineering
Degree Level and Degree Type	Bachelor's; Bachelor of Science
Title of Proposed Program	Sustainable Urban Environmental Engineering
Total Number of Credits	120
Suggested Codes	HEGIS: 922.00 CIP: 14.1401
Program Modality	<input checked="" type="radio"/> On-campus <input type="radio"/> Distance Education (<i>fully online</i>)
Program Resources	<input type="radio"/> Using Existing Resources <input checked="" type="radio"/> Requiring New Resources
Projected Implementation Date	<input checked="" type="radio"/> Fall <input type="radio"/> Spring <input type="radio"/> Summer Year: 2023
Provide Link to Most Recent Academic Catalog	URL: catalog.morgan.edu

Preferred Contact for this Proposal	Name: Dr. Phyllis Keys
	Title: Interim Associate Vice President for Academic Affairs
	Phone: (443) 885-3350
	Email: Phyllis.Keys@morgan.edu

President/Chief Executive	Type Name: Dr. Hongtao Yu, Provost & Senior Vice President for Academic Affairs
	Signature:  Date: 05/16/2022
	Date of Approval/Endorsement by Governing Board: 05/03/2022

Morgan State University

Proposed

Bachelor of Science (BS) in Sustainable Urban Environmental Engineering

(New B.S. Program)

A. Centrality to Institutional Mission and Planning Priorities:

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

The School of Engineering at Morgan State University (MSU) is proposing the creation of a Sustainable Urban Environmental Engineering (SUEE) Bachelor of Science (B.S.) degree program. This program will provide a leadership role in Maryland's economic and social development by preparing SUEE graduates to join a high-quality educated workforce in an area of national need. The development of a new bachelor's degree in SUEE will contribute to meeting the strategic goals of the university by providing affordable, accessible, and pedagogically structured education and research programs. The formalized degree program will provide vital transformative STEM education and world-changing research opportunities for undergraduate students. The SUEE curriculum trains future engineers to apply their technical understanding to protecting human and environmental health in urban settings. Environmental impacts are a consequence of human development, activities, and the practice of every discipline of engineering. SUEE seeks to educate students across the various sub-disciplines of environmental engineering and will incorporate design, practices, and processes that are harmonious with the Earth's ecosystems.



Figure 1. Conceptualization of the concentrated area of the SUEE program

Environmental problems including water, wastewater, solid/hazardous waste, air pollution, and geo-hazards in urban areas are serious environmental challenges that face the world today. The proposed SUEE B.S. degree program prepares graduates to make cities more sustainable and resilient. The program will ensure graduates understand the social and technical issues in urban environmental problems and gain an appreciation of the policy and planning approaches that are necessary to create livable, sustainable, and equitable cities. Graduates are prepared to enter various fields related to SUEE including education, consulting, research, administration, and others from the surrounding region. The program offers six primary sub-disciplines in the following six concentrations (see Figure 1):

1. Urban Sustainability Engineering,
2. Urban Water and Wastewater Engineering,
3. Solid and Hazardous Waste Management,
4. Urban Stormwater Management,
5. Urban Geo-environmental Engineering, and
6. Air Pollution Control.

The program ensures that graduates acquire the ability to master the fundamental principles of SUEE.

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

MSU is the premier urban public research university in Maryland, known for its excellence in teaching, intensive research, effective public service, and community engagement. MSU prepares diverse and competitive graduates for success in a global, interdependent society. The goal of the proposed program, Sustainable Urban Environmental Engineering (SUEE), is to design, develop, maintain, and improve urban systems associated with urban living and environments, focusing on ultimately improving human and environmental well-being. This requires an integrated understanding of human and natural systems and managing the complexities of urbanization under competing local, national, and global dynamics. This program is anticipated to be affordable for a broad, diverse group of students throughout our region, attracting highly motivated learners who have a passion for achieving sustainable urban environments, and who aspire to careers in engineering, consulting, research, or public administration.

The proposed program, housed under the Department of Civil Engineering at MSU, will be the only environmental engineering bachelor's program among public institutions in Maryland. The proposed program will be more *financially accessible* and will attract students who are highly motivated in the sustainable urban environment area and have the desire to pursue career paths in engineering education, consulting, research, administration, and others from the entire surrounding region.

The proposed new degree program differs from the Department's traditional undergraduate engineering track by requiring a new focused mix of core courses in mathematics, sciences, and general engineering, and incorporating new/existing courses in specific SUEE areas. The

B.S. degree programs will provide an interdisciplinary curriculum in the engineering area that prepares graduates to assume professional positions in SUEE.

Senate Bill 1085 (2017) designates MSU as the State's *preeminent public urban research university*. MSU must develop an overall plan that is consistent with the statewide plan for higher education and the Maryland Charter for Higher Education that provides for the enhancement of MSU as the State's *preeminent public urban research university*. In addition to its current responsibilities, MSU must firstly be dedicated to the development and delivery of comprehensive and high-quality academic programs and services to its university community and the citizens of Maryland, particularly to the citizens of Baltimore city, and secondly serve a diverse citizenry in an innovative and collaborative manner, all the while exercising its responsibilities with uncompromising integrity through strong, but compassionate leadership.

Designated as Maryland's public urban university, MSU has a responsibility to address the needs of the citizens, institutions, and agencies within the Baltimore metropolitan area through academic, research, and service programs. This emphasis also guides Morgan's creation of education programs that address the state's urban concerns, offering degree programs approved by its Board of Regents and the Maryland Higher Education Commission (MHEC). MSU promotes economic development by meeting critical workforce needs through its programs in emerging professional fields. The Maryland Charter for Higher Education is a statement of public policy for higher education in Maryland, which comprises Title 10, Subtitle 2 of the Education Article. Morgan must develop an overall plan that is consistent with the statewide plan for higher education and the Maryland Charter for Higher Education that: sets forth both long-range and short-range goals, objectives, and priorities for postsecondary education, research, and service provided by MSU; subject to the specified authority of MHEC; identifies the role, function, and mission of MSU; provides for the enhancement of MSU as the State's public urban university; encourages and supports high-quality programs on its campuses; and stimulates outreach to the community and State through close relationships with public elementary and secondary schools, business and industry, and governmental agencies.

The proposed SUEE program will meet the anticipated employment needs of a wide variety of public and private organizations including engineering consulting firms, colleges/universities, public agencies at all levels of government, regional and city planning commissions, regional planning agencies, and private sectors. The demand for well-trained engineers continues to grow as the nation prepares to develop and maintain efficient, economical, socially, and environmentally acceptable public urban environmental engineering areas.

The rationale for the proposed program is three-fold:

1. Morgan will be able to provide an effective improvement to the pre-existing baccalaureate, master's, and doctorate programs in Engineering and the proposed program will grow the number of engineering students at Morgan State. While Morgan State's Civil Engineering program focuses on all sub-disciplines of the major, SUEE has an emphasis on Environmental

Engineering in the urban landscape which is unique and aligns well with the university's enhanced mission of being Maryland's preeminent public urban research university. The interest in this area has been evident from the proportion of undergraduates pursuing this concentration, as well as the growing number of students pursuing Masters and Doctoral degrees in this subject area in the Department of Civil Engineering. The Clarence M. Mitchell, Jr. School of Engineering awards degrees in the following programs: Civil Engineering, Electrical and Computer Engineering, Industrial and System Engineering, Mechatronics Engineering, and Transportation and Urban Infrastructure Studies. Since the inception of the engineering program, MSU's civil engineering program has graduated a large number of African Americans and the majority of them occupy responsible positions in private and public sectors. The proposed program will not only attract more African American students, but the field of Environmental Engineering historically attracts a greater share of female students.

2. A second rationale for the proposed program is its importance to minority achievement in Engineering and Applied Science at both national and state levels. Morgan leads all other campuses in Maryland in the number of bachelor's degrees awarded to African Americans in Engineering and consistently ranks among the national leaders in the production of African Americans receiving their degrees in Engineering.

3. Morgan is prepared now to offer the SUEE program in the Department of Civil Engineering, not only because of the specific needs of minorities in this field, but also because of the strength of its faculty and the outcomes of its current programs. The faculty members are actively involved in high-level research and national/international professional activities. In addition, the department benefits from the interdisciplinary strength of a diverse faculty in the School of Engineering. Students will work with faculty who are committed to participating in collaborative cutting-edge research and experiential learning. Thus, graduates will be poised to hold leadership roles in the engineering field.

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

The new program in the Civil Engineering Department (CED) will not only create desirable synergies with the pre-existing degree programs in civil engineering, but it will also extend the reach of the Mitchell School of Engineering with its interdisciplinary focus on social, environmental, economic, and policy issues that draw on other closely related fields at MSU. The program builds upon the strengths of MSU by leveraging resources and space from established units such as Civil Engineering at MSU. The engineering programs have some connections to the SUEE area, thus potential synergy and collaborations exist with the proposed SUEE B.S. program. The traditional areas of environmental engineering are closely linked to programs in Civil Engineering, whereas the emerging areas such as urban sustainability and urban environmental issues are linked to all engineering disciplines. This improvement will serve as a resource center for addressing timely cross-cutting issues of the community. The SUEE program will support and sustain the Department of Civil Engineering

in the School of Engineering, thereby, burnishing Morgan's position of leadership in engineering education and research. The University has committed financial resources to initiate this program. Required courses in the first year of the program can be taught by existing faculties in environmental, water resource, and geotechnical areas in the CED and current laboratories for fluid, hydraulic, geotechnical, and environmental engineering will be used for undergraduate student laboratory exercises. The SUEE program will be housed in the CED. The program will then transition to an independent program, with a budget allocation to support laboratory staff as well as laboratory equipment and supplies for students taking courses in the SUEE.

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

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

MSU has a strong commitment to all academic programs for the contributions they make to the education of a broad public and the potential to transform our neighbors in the City of Baltimore. The program was approved by the Board of Regent on May 3, 2022, with the full support of President David Wilson and Provost Dr. Hongtao Yu. The program will have an initial allocation of the related area of the civil engineering faculties and facilities with additional support as the student enrollment increases. The School of Engineering and later the SUEE program will receive a budget allocation through the University budgeting process. The Civil Engineering Department has a convincing infrastructure at the Center for the Built Environment and Infrastructure Studies that includes three environmental laboratories, three fluid/hydraulic laboratories, and three geotechnical engineering laboratories which can support students in the proposed SUEE program.

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

Morgan has an over 150-year history in Baltimore City and is committed to remaining a vibrant institution into the foreseeable future. Our current financial stability ensures that the University is positioned to support enrolled students. The School of Engineering will ensure that all students are adequately supported by sufficient faculties, and strong infrastructures will be retained to ensure all enrolled students can complete their degree program.

B. Critical and Compelling Regional or Statewide Need as Identified in the State Plan:

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

a) The need for the advancement and evolution of knowledge

Morgan State is uniquely positioned to engage in these interdisciplinary areas of engineering targeting the difficult urban and coastal environmental challenges which will require approaches from individuals of diverse backgrounds and a broad understanding of engineering and sustainability principles. The program at MSU will provide frameworks and

models that demonstrate ecologically innovative and sustainable actions that promote the successful paradigm shift for the future as we consider the impacts of climate change, emerging contaminants, and innovation for civil and energy infrastructure. The SUEE program will expand the knowledge base in Maryland in the comprehension of the importance of sustainable practices, technologies, and retrofits for urban infrastructure. The data acquired through this degree program work will provide opportunities to measure the benefits, define the tradeoffs, and assess the environmental impact on the ecosystem services by integrating “green” into everyday functions. This degree program will further support the local, state, regional, and federal agencies in the operation and maintenance of the built environment and will play a significant role in the planning, design, construction, and processes of future systems for energy, transportation, buildings, water, and waste. This program will fully leverage Maryland’s investment in Morgan’s research and teaching infrastructure with the Center for the Built Environment and Infrastructure Studies (CBEIS).

The Department of Civil Engineering is housed in the Center for the Built Environment and Infrastructure Studies (CBEIS) which is a 126,000 GSF USGBC Gold LEED-certified shared facility for academic engineering and design programs at MSU. CBEIS houses research and instructional programs for the School of Architecture and Planning and the School of Engineering's Civil Engineering, Transportation Studies, and the National Transportation Center, in a highly collaborative environment within and among these disciplines. The department also has 18 laboratory spaces, 12 of which are related to the proposed program. The Environmental Engineering program is strengthened by these laboratory capabilities and faculty expertise that have allowed us to partner on research with programs across campus in the transportation (NTC), Patuxent Environmental and Aquatic Research Laboratory (PEARL), School of Architecture & Planning (SA+P), Center for Excellence in Mathematics and Science Education, and the School of Computer, Mathematical and Natural Sciences (SCMNS). These efforts include the participation of Civil Engineering undergraduate and graduate students with faculty and students from these other disciplines in areas of environmental analysis, design, and innovation. The degree program would allow MSU to identify those academic and research units, capabilities, and individuals to form and cultivate new interdisciplinary programmatic thrusts.

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

Morgan State University has a very important role in providing an avenue to individuals from diverse and underrepresented backgrounds for opportunities to explore and pursue environmental careers and research. The development of this degree shows MSU's commitment to addressing the issues pointed out in the state's Task Force on Minority Participation in the Environmental Community. The 2007 final report identified the following issues: the need for environmental education programs at historically black colleges and universities to provide opportunities for students to take part in the environmental arena and encourage student participation in community development, and improve the flow of information and services into minority communities regarding land conservation, protecting natural resources, open space, and land via conservation

easements. This program would address three main areas of concern namely: (1) the lack of minorities in key policy positions throughout the state government; (2) the lack of minority participation in the efforts to protect and restore the Chesapeake and Coastal Bay watersheds, and (3) the lack of education programs directly connecting minority health issues to the disparate environmental conditions that prevail in some communities.

c) The need to strengthen and expand the capacity of historically black institutions (HBIs) to provide high quality and unique educational programs

Traditional areas of engineering disciplines such as chemical, computer, civil, computer science, electrical, and mechanical engineering are readily available at more than 50% of HBIs. While only one HBI program offered an ABET-accredited Environmental Engineering B.S degree in the United States which is Central State University in Wilberforce, Ohio. No public universities including HBIs in Maryland's higher education system offer a separate Environmental Engineering bachelor's degree.

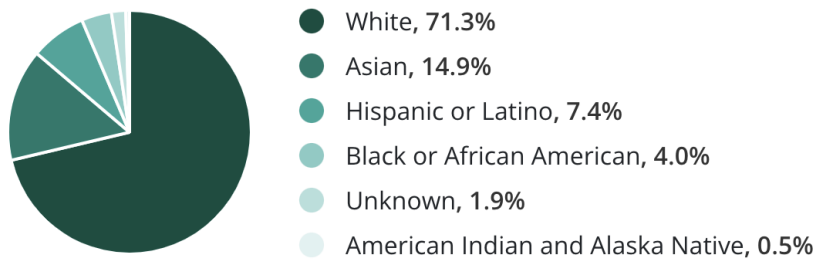


Figure 2. Environmental Engineering Statistics by Race

The most common ethnicity among environmental engineers is White, which makes up 71.3% of all environmental engineers. Comparatively, there are 14.9% of Asian ethnicity, 7.4% of Hispanic or Latino ethnicity, and 4.0 % of Black or African American ⁽¹⁾.

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

A B.S. degree in SUEE supports the State Plan including access, success, and innovation. The degree will prepare students for career success with both public and private employers as well as for graduate school. This degree program particularly supports the goal to foster innovation and improve student success as follows:

- **Workforce Development:** SUEE as a discipline develops many applications that are used in industry and will require strong partnerships between the School of Engineering and businesses. Local and national environmental engineering companies will serve in an advisory capacity and provide summer or full-time employment for students as we build the program. Existing relationships with employers will be expanded and new relationships will be established for this to occur. One of the strengths of the engineering Student Work Experience Program and the Morgan Career Center is the number of permanent positions that engineering students have available to them upon graduation.

- Life-long learning: Engineers are expected to keep abreast of developments in the discipline including the ability to rate information sources and to ensure that they pursue additional educational activities through workshops and graduate study. The SUEE courses will provide students with the skill to make these decisions and to evaluate their understanding of the technical topics. Graduates will not only be prepared for the state of the industry when they graduate, but they will also be prepared to adapt to changes in the field as they occur.
- Research partnerships: Due to the rapid development of innovations in the field of SUEE and the supporting disciplines, both students and faculty will need to have strong research expertise. The newly hired faculty in this program will be expected to support active research programs and can include undergraduate students in research activities through special topic courses.

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

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

There are a variety of career opportunities for environmental engineering professionals to pursue. These jobs span several specialties with a combined purpose to reduce waste, lower the environmental impact of pollution, and encourage positive relationships between man-made systems and nature. Though the outlook of each career path will vary, on the whole, sustainability careers are slated for strong growth well into the future. Environmental engineering, with an urban sustainability focus, is a burgeoning industry that is growing as technology advances and the world's natural resources become more and more scarce. Salaries for environmental and sustainability professionals vary greatly and are dependent on industry, job responsibilities, regional cost of living, level of education, and the size of the business. Below are the salary ranges for sustainability roles, such as sustainability associate, specialist, manager, and director. The annual salary for environmental engineers is \$95,460⁽²⁾ which is higher than the United States median (\$92,120). The average annual salary for an environmental engineer in the State of Maryland is 38% above the national average (2018)⁽³⁾.

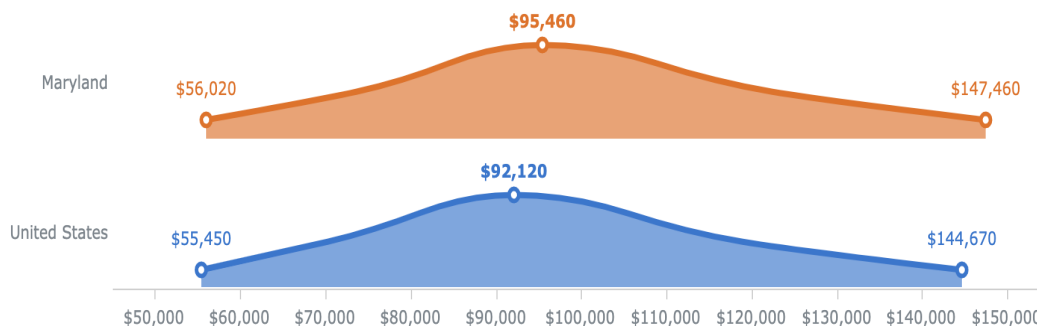


Figure 3. Annual salary for environmental engineers in Maryland vs. US⁽⁴⁾

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

Green jobs and careers in this space are now also replacing jobs that once existed in many of the non-sustainable industries of the 20th century. Projected job growth for environmental engineers is strong and steady at a growth rate of 8% is expected for the ten years leading up to 2030. In the state of Maryland within the related SUEE occupations of Environmental Engineer and Environmental Scientist / Specialist, the expected job growth is faster than average between 7.45% and 13.18%, respectively, based on Maryland Long Term Occupational Projections (2018 - 2028)⁽⁵⁾.

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

Environmental engineers use their knowledge to design systems that control pollution and protect public health. Environmental Engineers design systems, processes, and equipment to control waste and pollution, such as stack scrubbers and wastewater management systems. Environmental engineers coordinate waste management and recycling activities. In addition to controlling pollution, environmental engineers also design systems, processes, and equipment to help clean it up. The systems they create restore air, soil, and water quality at sites that have been contaminated. Some environmental engineers work at the front lines of the clean energy economy, developing systems that convert waste into electric power. Over the next 10 years, it is expected the US will need 8,600 environmental engineers ⁽⁵⁾. That number is based on 4,500 additional environmental engineers, and the retirement of 4,100 existing environmental engineers in the United State ⁽⁶⁾. However, graduates will be needed for some environmental scientist, environmental specialist, electrical and computer engineering positions which are also projected at 10,000+ new positions in the next 10 years. There are currently an estimated 53,800 environmental engineers in the United States.

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

According to the ABET database of accredited bachelor's degree programs ⁽⁷⁾, of the 85 accredited environmental engineering criteria programs in the United State, only one program, which is provided by Johns Hopkins University (a private school), is within Maryland's higher education system. There is no environmental engineering bachelor's degree program in the Maryland public education system. Central State University ⁽⁸⁾ is the only HBI providing an ABET-accredited environmental engineering bachelor's degree in the United States. Morgan State University is thus uniquely positioned to address this need within the State of Maryland and around the country. The proposed program is forward-looking and prepares graduates for multidisciplinary careers.

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.

Seventeen similar undergraduate-level academic programs related to the environmental curricular area are identified at 14 universities in Maryland State:

- Four Major programs in Environmental Science & Studies at Towson University, Goucher College, McDaniel College, and St. Mary’s College of Maryland.
- One B.A. degree program in Geography & Environmental Studies at the University of Maryland Baltimore County.
- Twelve B.S. degree programs in Environmental Science at Washington College, Stevenson University, Mount St. Mary’s University, Environmental Studies at Washington College and Salisbury University; Environmental Analysis and Planning at Frostburg State University, Environmental Studies & Policy at Hood College, Environmental Health and Engineering at Johns Hopkins, Environmental Science & Technology at University of Maryland College Park, Environmental Science & Policy at University of Maryland College Park, Architecture & Environmental Design at Morgan State University, Geography & Environmental Studies at University of Maryland Baltimore County, and Chemical Engineering with a concentration in Environmental Engineering (Master degree) at University of Maryland Baltimore County.

In brief, fourteen out of the seventeen programs are in science. Only two of them are in Engineering: Environmental Engineering at Johns Hopkins and Chemical Engineering with a concentration in Environmental Engineering & Sustainability at the University of Maryland Baltimore County. However, Johns Hopkins is private, not public. And Chemical Engineering is not Environmental Engineering. Therefore, the proposed B.S. degree program in SUEE at MSU would be the first one in Environmental Engineering among the public universities in the State of Maryland (please see the programs mentioned above listed in the table below)

Table 1: Undergraduate-level academic programs related to the environmental area

Program	Institution(s)
Environmental Studies	Goucher College; Hood College; Johns Hopkins University; McDaniel College; Salisbury University; St. Mary’s College of Maryland; University of Maryland, Baltimore County; Washington College
Environmental Engineering	Johns Hopkins University
Environmental Science	Johns Hopkins University; Mount St. Mary’s University; Stevenson University; University of Maryland Eastern Shore; University of Maryland, Baltimore County; Washington College
Environmental Science and Studies	Towson University
Environmental Science & Technology	University of Maryland College Park
Environmental Science & Geography	University of Maryland, Baltimore County
Geography & Environmental Studies	University of Maryland, Baltimore County

Environmental Management	University of Maryland Global Campus
Environmental Sustainability	University of Baltimore
Environmental Health	Salisbury University
Architecture & Environmental Design	Morgan State University
Environmental Design	Maryland Institute College of Art

2. Provide justification for the proposed program

There is no B.S. degree program in Environmental Engineering among the public universities in the State of Maryland and there is a growing need for graduates with this expertise. The Bachelor's degree in SUEE will position MSU to lead the State in the preparation of students for growth areas such as coastal urban environmental infrastructures and resilience in response to global warming, sea-level rise, and land subsidence.

E. Relevance to High-demand Programs at Historically Black Institutions

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

Environmental risks can have destabilizing effects within communities and at the national level, as has been the case with the Covid pandemic, so it is important to train the workforce that would address environmental risk factors that may contribute to pandemics. This is because people who are already socioeconomically disadvantaged disproportionately face the consequences of environmental contamination in the urban community. This program will be addressing deep-seated urban and global issues like environmental contamination and the social inequities of their impact. By starting this program at MSU, we would be at the forefront of investing in the training of the workforce that would provide sustainable solutions to environmental problems that would make a significant and positive impact on public health, especially in disadvantaged communities that already face health challenges arising from air, water, and soil pollution. The students that would graduate from this program would provide much-needed sustainable innovative solutions to environmental threats to the nation’s health and security of the vulnerable community.

In the awarding of bachelor's degrees in Civil Engineering to African Americans, Morgan State is first amongst all universities in the State of Maryland and second amongst all HBCUs nationwide (10, 11). The addition of a degree program in SUEE to the degree programs in the School of Engineering at Morgan will solidify our prominence in this area while contributing to the growth of the regional economy. The proposed program will not duplicate efforts at other Maryland universities. The proposed SUEE program at MSU would continue to sustain the commitment of MSU as the designated Urban University in the state of Maryland.

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

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

MSU is the largest HBI in Maryland and the only one to have a comprehensive engineering program that offers undergraduate and graduate degrees. MSU also provides a challenging yet supportive environment to a diverse student population. In addition, we are known for the production of African American engineers, including those that go on to earn doctorates in engineering. Investing in training of the workforce and research on sustainable solutions to CECs environmental problems in the urban settings calls for the development of a program in SUEE at MSU. The addition of the degree program in SUEE will ensure that our graduates remain competitive with students from other institutions. This SUEE program at MSU supports the University's mission to empower a diverse population leading the world.

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

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

The program offers core and elective courses taught by faculty members in SUEE as well as the opportunity for students to take courses in other departments. The proposed program will encompass both STEM (Science, Technology, Engineering, and Mathematics) and non-STEM aspects of Engineering, including policy analysis, spatial analysis, planning, safety, and risk management. The program is intended for cultivating exceptional students from STEM and non-STEM fields committed to pursuing career paths leading to teaching, high-level research, think-tank consulting, or administration in specialized areas of SUEE, including planning, operations, management, and policy analysis. Thus, the goal of the new program dovetails with Morgan State University Strategic Plan whose objective focuses on the transformation of the University into a top-tier research institution and a national leader in producing highly skilled graduates in STEM and non-STEM related areas.

In particular, the new B.S. program addresses the following aspects of MSU's mission:

- providing quality teaching, research, and service for the citizens of the state, with a special emphasis on meeting the needs of culturally diverse and multi-ethnic populations living in Baltimore as well as in other centers within the state and the nation
- enrolling an academically diverse student population, including some who might not otherwise attend a college or university, in a program that is informed by diversity relating to experiences of race, ethnicity, gender, class, sexuality, ability, or other markers of identity
- increasing the number of minorities in fields in which they are underrepresented

- training the workforce of Baltimore City and Maryland in professions essential to the economic, political, educational, social, and/or cultural well-being of the city, state, and nation

The program is being developed under the leadership of the Dean of the School of Engineering and the chairperson of the Civil Engineering Department (CED) with review by the school-wide Curriculum Committee which has representatives from all engineering departments.

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

The program is designed to allow students to obtain an undergraduate degree in four years. This four-year degree program will endeavor to obtain ABET accreditation, which will enable the students of SUEE to be credentialed as an engineer-in-training and eventually as a professional Environmental Engineer. Students will learn the core principles of sustainability and design sustainable urban environments and related tasks.

The primary objectives of the SUEE are consistent with those of the School of Engineering and are listed as follows:

- Develop the confidence and competence required to meet the challenges associated with careers.
- Produce competitive engineers based on regional and national accreditation guidelines.
- Exhibit educational leadership in accomplishing the task of increasing the representation of African Americans and others who are underrepresented among engineering professionals.

The Program Educational Objectives of the SUEE are to grow the number of graduates from the program that assume top managerial and leadership roles in their chosen professional careers;

- Assume managerial and/or leadership roles in their chosen professional careers within six years of graduation.
- Be employed and function well in the sustainable urban environmental engineering system and processes, and STEM-related areas.
- Make contributions that advance the current state-of-the-practice in technology and/or research of engineering systems and processes; and
- Continue their professional development through continuous improvement and lifelong learning (e.g. graduate school, professional engineering (PE) licensure, professional certifications, etc.).

Program outcomes: The SUEE program outcomes serve as specific guidelines and standards of the core knowledge, skills, and abilities that students are expected to achieve by the time of graduation. The outcomes also indicate the minimum standards of achievement for students matriculating through the program. The program will produce students who

can facilitate innovation and synthesis of new products and services, as well as improve existing products, in a global context. Students become leaders and/or major contributors to their profession, community, and organizations. Students also continue the learning process throughout their careers, remain effective in their employment in engineering and other professional career fields, and provide service to their profession and community at large.

The outcomes of the SUEE Program in the School of Engineering at MSU are closely aligned with the guidelines of the ABET for accredited engineering programs. All graduates from the SUEE Program will demonstrate:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

3. Explain how the institution will:

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

The School of Engineering has three ABET-accredited undergraduate engineering programs (through the Engineering Accreditation Commission) with a robust continuous improvement process that includes rubrics for assessment of student outcomes using performance criteria, Department-level evaluation of student outcomes, and the use of this evaluation for course, as well as program, improvement. The SUEE program will utilize a similar process (and software tools) to assess and document student achievement of learning outcomes.

b) Document student achievement of learning outcomes in the program

The Associate Dean of Undergraduate Studies is responsible for monitoring ABET activities in each department and will assist with establishing the process. The Department of Civil Engineering will pay close attention to the progress made by the students in the curriculum. Each student will be assigned an academic advisor who will play a significant role in student achievement of learning outcomes in the program. Students can find their faculty advisor assigned by the department office through the WebSIS. The faculty advisor approves all

course schedules and any changes that are made, and provides vital information about the program's curriculum, courses, activities, and provides guidance to the student in preparing course schedules. Students are encouraged to get to know their advisors as early as possible as it is beneficial for students' success in accomplishing their goals through the SUEE program.

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

A minimum of 120 credit hours are required of students pursuing the B.S. Degree. These credit hours are distributed as follows:

Table 2: Requirements for 120-Credit Hours

Course Category	Credit
General Education and University Requirements – Group A	45
Mathematics and Science Requirements – Group B	25
SUEE Core Requirements – Group C	50
Total	120

CE students must complete all of the required courses in Groups A, B, and C in Table 2 for the degree of B.S. in SUEE.

Group A- General Education and University Requirements

Group A is General Education and University Requirements with a total of 45 credits. General education requirements are set by the university (Table 3). Students need to take these courses from the relevant departments in various schools. Descriptions of these courses can be found in the department catalogs at Morgan's website:

http://www.morgan.edu/academics/academic_catalogs.html

Table 3: General Education and University Requirements – Group A

Course #	Course name	Credit	Prerequisites	Co-requisites
BIOL 101	Introduction to Biology (BP)	4	None	None
CEGR 107	Computer-Aided Engineering Graphics, Analysis & Design (IM)	3	None	None
ECON 211/212	Principles of Economics II/I (SB)	3	None	None
ENGL 101	Freshman Composition I (EC)	3	None	None
ENGL 102	Freshman Composition II (EC)	3	ENGL 101	None
HLTH 103	Health Education (HH)	3	None	None
HIST 101/105	World History I/US History (SB)	3	None	None
HIST 350	Introduction to African Diaspora(CI)	3	None	None
HUMA 201	Introduction to Humanities I (AH)	3	None	None
OREN 104	Freshmen Orientation for SOE	1	None	None
MATH 241	Calculus I (MQ)	4	MATH 114/141	None

PHEC XXX	Physical Education	1	None	None
PHIL 109	Introduction to Logic (CT)	3	None	None
PHIL 220	Ethics and Values (AH)	3	None	None
PHYS 205+L	University Physics I + Lab (BP)	5	MATH 241	PHYS 205L
Remark: Total General Education and University Requirements - 45				

Group B-Math and Basic Science Requirements

Group B is a group of courses for the mathematics and basic science requirements (a total of 25 credits) for undergraduate students in Civil Engineering and Sustainable Urban Environmental Engineering. Table 4 shows the list of courses in Group B for both programs. CE and SUEE students need to take these courses in the appropriate departments. Description of the courses may be found in the department catalogs at:

http://www.morgan.edu/academics/academic_catalogs.html

Table 4: Group B- Math and Basic Science Requirements

Course #	Course name	Credit	Prerequisites	Co-requisites
CEGR 307	Computer Method & Programming for CE	2	CEGR 107, MATH 243, and MATH 340	PHYS 206 PHYS 206L
CHEM 110	General Chem. for Eng. (BP)	4	None	None
MATH 242	Calculus II	4	MATH 241	None
MATH 243	Calculus III	4	MATH 242	None
MATH 340	Differential Equations	3	None	CEGR 214
IEGR 251	Probability and Statistics	3	MATH 242/MATH 241	None
PHYS 206+L	University Physics II	5	PHYS205+L, MATH 242	PHYS 206L
Remark: total required Mathematics and Basic Science Requirements – 25 credits				

Group C- Core Requirements of the SUEE program

Group C is the group of core courses required by SUEE (50 credits). Table 5 shows the list of the courses as the main requirements for all undergraduate students in the SUEE program.

Table 5: Group C -Required SUEE Core Requirements (50 Credits)

Course #	Course name	Credit	Prerequisites	Co-requisites
CEGR 106*	Introduction to CE and SUEE	1	None	None
CEGR 110	Survey Technologies in CE	2	None	None
CEGR 202	Statics	3	PHYS 205, PHYS 205L	MATH 242,CEGR 106, CEGR 107
CEGR 212	Mechanics of Materials & Lab	3	CEGR 202	None
CEGR 214	Fluid Mechanics and Lab	3	MATH 243	MATH 340, CEGR 110
CEGR 220**	Introduction to Urban Sustainability	3	CEGR106, CEGR 110	None
CEGR 230**	Environmental Chemistry	3	CHEM 110+L	None
IEGR 305	Thermodynamics	3	CEGR 214, PHYS 206+L	None

CEGR 325	Geotechnical Engineering Fundamentals & Lab	3	CEGR 212	None
CEGR 332	Hydraulic/Water Resources Eng.	3	CEGR 214	None
CEGR 338	Environmental Eng. I & Lab	3	BIO101, CHEM 110+L, CEGR 214, MATH 242	None
CEGR 350**	Intro to Air Pollution Control	3	CEGR 338	None
CEGR 400	Project Management, Finance Entrepreneurship	2	ECON 211/212, IEGR 251	None
CEGR 460	Hazardous Waste Management	3	CEGR 332, CEGR 338	None
CEGR 463	Physical-Chemical Treatment of Water and Wastewater	3	CEGR 332, CEGR 338	None
CEGR 492*	Senior Design Project I	2	CEGR 332, CEGR 340 CEGR 350, CEGR 360,	CEGR 400, IEGR 305
CEGR 493	Senior Design Project II	1	CEGR 492	None
CEGR 4XX	2 approved in the electives list. Note: Must take one out of two is from the track of SUEE Electives.	6	CEGR 340/CEGR 350/CEGR360	None
Remark: total required core courses in SUEE – 50 credits.				

* *Modified course*

** *New course*

The SUEE program offers various elective courses as indicated in Table 6. After completion of the majority of SUEE core requirements, an SUEE student must take at least two elective courses (6 credits) from a specific area listed in Table 6. All of these courses are numbered as CEGR 4XX (400+ level) and are often referred to as senior elective courses. These courses are offered periodically or offered as needed according to the number of SUEE students interested. It is highly suggested that one plans ahead and selects at least three elective courses after discussing plans with an academic advisor.

Table 6: CEGR 4XX (6 Credits) from SUEE Elective Courses

Course #	Course name	Credit	Prerequisites	Co-requisites
CEGR 410/CEGR 610*	Stormwater Management	3	CEGR 332	None
CEGR 411/CEGR 611*	Hydrologic Modeling	3	CEGR 410	None
CEGR 412/CEGR 612*	Stormwater Modeling	3	CEGR 410	None
CEGR 413**	Intro. to Geo-Environmental Hazard	3	CEGR 325	None
CEGR 414**	Urban Sustainable Design Engineering	3	CEGR 338	None
CEGR 415**	Fate and Transport of Substances	3	CEGR 338	None
CEGR 455	Seepage, Drainage, and Groundwater	3	CEGR 325	
CEGR 457	Geotechnical Engineering	3	CEGR 325	None
CEGR 458	Biological Wastewater Engineering	3	CEGR 332, CEGR 338	None
CEGR 459	Water Supply Engineering	3	CEGR 332 CEGR 338	None
CEGR 464	Environmental Engineering II	3	CEGR 332, CEGR 338	None
CEGR 470	Energy Efficiency in Buildings	3	PHYS 206, PHYS 206L	None

			CEGR 400	
CEGR 480	Fundamentals of Geographic Information Systems	3	CEGR 110, CEGR 307	None
CEGR 481	Fundamentals of Remote Sensing	3	CEGR 110, CEGR 307	None
CEGR 498	Topics in Civil Engineering	3	Senior Standing with 90 credits +	None

* cross-listed as open to both undergraduates and graduate students (CEGR 610)

** new course

SAMPLE PROGRAM FOR SUEE STUDENTS

Table 7 shows a suggested plan of study for SUEE students, starting with Calculus I (MATH241). If a student starts with a lower-level mathematics course, e.g., MATH 106, MATH 113, MATH 114, MATH 141, ENGR 101, or ENGR 102, the student will need to see the advisor to adjust his or her schedule for the first semester. If a student starts with a lower-level course in mathematics, it is highly suggested that he or she take a summer or winter mathematics class to catch up to this schedule.

Table 7: A Sample Study Plan for CE Freshman

First Semester		Credits	Second Semester		Credits
FRESHMAN YEAR					
OREN 104	Freshman Orientation for Engineering	1	CEGR 106	Introduction to SUEE	1
ENGL 101	Freshman Composition I	3	PHYS 205 +L	University Physics + Lab	5
BIOL 101	Introduction to Biology I	4	MATH 242	Calculus II	4
MATH 241	Calculus I	4	ENGL 102	Freshman Composition II	3
CEGR 110	Survey Technologies	2	ECON 211 ⁵	Principles of Economics	3
CEGR 107	Computer Aided Engineering Graphics, Analysis & Design	3	ECON 212 ⁵	OR Principles of Economics II	
TOTAL		17	TOTAL		16
SOPHOMORE YEAR					
CEGR 202	Statics	3	CEGR 212	Mechanics of Materials & Lab	3
PHYS 206 +L	University Physics II	5	CEGR 214	Fluid Mechanics & Lab	3
PHEC XXX	Physical Education	1	IEGR 251	Probability and Statistics	3
MATH 243	Calculus III	4	MATH 340	Intro to Differential Equations	3
CEGR 220	Introduction of Urban Sustainability	3	CHEM 110+Lab	General Chem. for Eng. (BP)	4
SUBTOTAL		16	SUBTOTAL		16
JUNIOR YEAR					
CEGR 230	Environmental Chemistry	3	CEGR 332	Hydraulic/Water Resources Engineering	3
CEGR 325	Geotechnical Engineering Fundamentals & Lab	3	CEGR 463	Physical-Chemical Treatment of Water and Wastewater	3
CEGR 307	Computer Methods & Program.	2	CEGR 350	Air Pollution Control	3
HUMA 201	Introduction to Humanities I	3	CEGR 460	Hazardous Waste Mgmt.	3
CEGR 338	Environmental Eng. & Lab	3	PHIL 220 ⁴	Ethics & Values	3
SUBTOTAL		14	SUBTOTAL		15
SENIOR YEAR					
CEGR 492	Senior Review and Project Proposal	2	CEGR 493	Senior Project	1
IEGR 305	Thermodynamics	3	CEGR 4XX	SUEE Technical Elective I	3
			CEGR 4XX	SUEE Technical Elective II	3
CEGR 400	Project Management, Finance & Entrepreneurship	2	HIST 101 ²	World History OR	3
HLTH 103 ¹	Social Determinants of Health	3	HIST 105 ²	History of the U.S.	
PHIL 109 ³	Introduction to Logic	3	HIST 350 ⁶	Introduction of African Diaspora	3
SUBTOTAL		13	SUBTOTAL		13
TOTAL CREDIT HRS					120

¹ HLTH 103 (HH) Strongly recommended

² HIST 101 or HIST 105 (SB) Strongly recommended

³ PHIL 109 (CT) Strongly recommended

⁴ HUMA 201 and PHIL 220 (AH) Strongly recommended

⁵ ECON 211/ 212 (SB) Required.

⁶ HIST 350 Strongly recommended

SUEE COURSE DESCRIPTIONS

OREN 104 FRESHMAN ORIENTATION FOR ENGINEERING MAJORS - *Two hours lecture; 1 credit.* This course is designed to prepare students for the rigors of earning an engineering degree. It introduces students to the expectations and demands of higher education, to the legacy and traditions of Morgan State University, to college success strategies, and to the broad array of career opportunities in the fields of engineering. Students enrolled in this class are required to attend selected University convocations, School of Engineering programs, and other prescribed activities. They are also required to hold conferences with their faculty advisors. Students transferring 24 or more credits to the University when admitted are exempt from this requirement. (Formerly ORIE104). (FALL/SPRING)

CEGR 106 INTRODUCTION TO CIVIL and SUEE - *Two-hour lecture; 1 credit.* This orientation course will introduce students to the concept of engineering design by exposure to several design problems from various areas of civil engineering and sustainable urban environmental engineering. Prerequisite: None. (FALL and SPRING)

CEGR 107 COMPUTER-AIDED ENGINEERING GRAPHICS, ANALYSIS & DESIGN - *Two hours lecture, two hours laboratory; 3 credits.* This course introduces students to computer-aided engineering graphics and engineering analysis in the context of defining, demonstrating and solving interesting but simple visualization and design problems in civil engineering; Review of geometry and trigonometry in conjunction with related computer graphics functions; data reduction and analysis, graphing and presentation. Introduction to Computer-Aided Drafting and Design (CADD) and to contemporary CAD/3D modeling and analysis software for civil engineers. Modeling exercises and design projects, with students working in teams and using computer analysis and design spreadsheets and technical word processing and presentation programs. (Formerly CEGR 201). Prerequisite: None. (FALL/SPRING)

CEGR 110 SURVEY TECHNOLOGIES - *Two hours lecture, two hours laboratory, 2 credits.* The course provides students with comprehensive knowledge and understanding of surveying technologies and their applications in Civil Engineering. It will highlight fundamental surveying measurements, traverse computations, coordinate geometry, mapping, GPS and GIS, circular and parabolic curves, earthwork, boundary surveys, CAD applications. Students will actively participate in data acquisition, mapping, surveying, site geometries, and geology. Prerequisite: None. (FALL/SPRING)

CEGR 202 STATICS - *Two hours lecture, two hours practicum; 3 credits.* Review of relevant concepts from geometry, algebra and calculus. Representation and resolution of vectors. Resultants of force and couple systems by graphical and analytical approaches. Particle interaction forces; Coulomb friction, spring behavior. Application of Free Body Diagrams in problem-solving. Equilibrium of particles and rigid bodies. Analysis of simple trusses and frames. Center of gravity, center of mass, and centroid of area. Reduction of distributed normal loads, internal reactions, area moments of inertia Practicum: Problem-solving in statics; forces and force components, moments and equilibrium, introduction to computer-aided design and simulations of simple structural systems. Project(s) would require oral and

visual presentation and written report. Prerequisites: CEGR 106, CEGR 107, PHYS 205 and PHYS 205L. Co-requisite: MATH 242. (FALL/SPRING)

CEGR 212 MECHANICS OF MATERIALS AND LABORATORY - *Two hours lecture, three hours laboratory; 3 credits.* Stress and strain for various types of loads - axial, shear, torsion and bending. Constitutive Laws. Multidimensional Hooke's Law. Stress concentration. Introduction to Indeterminate analysis - Equilibrium vs. Compatibility. Combined stresses in 2D and 3D using Mohr's Circle. Laboratory exercises to include tension, compression, bending and torsion. Concrete mix design and asphalt mix design. Elastic vs. plastic behavior of metals. Use of basic finite element software to investigate concepts of stress and deformation caused by external loads. (Formerly CEGR 301). Prerequisite: CEGR 202. (FALL/SPRING)

CEGR 214 FLUID MECHANICS AND LABORATORY - *Two hours lecture, three hours laboratory; 3 credits.* The lecture includes the following: studies of fluid properties; fluid statics and dynamics involving integral and differential forms of fluid behavior; viscous flow in pipes; losses in bends, fittings, valves, and flanges; and similitude and dimensional analysis. The laboratory includes properties of fluids; viscosity of fluids; vortex apparatus; stability of floating bodies; flow measurements; losses in straight runs of pipes; and losses in bends fittings, valves, and flanges (Formerly CEGR 311) Prerequisite: MATH 243. Co-requisite: MATH 340 and CEGR 110(FALL/SPRING)

CEGR 307 COMPUTER METHODS AND PROGRAMMING FOR CIVIL ENGINEERING - *Two hours lecture, two hours laboratory; 2 credits.* This course will introduce and reinforce computer methods and programming in Civil Engineering Analysis and Design. Overview of basic linear algebra, relevant numerical analysis algorithms, basic algorithm development and programming; types of variables, objects and classes, conversion of mathematical equations to objects and classes, and generation of corresponding software. Application of Spreadsheet and Computational-Math software to routine analysis and design; development of e-books in writing technical reports. Further exposure to general-purpose CAD, Modeling and Analysis software. Examples will draw from diverse sub-disciplines within Civil Engineering. Prerequisite: CEGR 107, MATH 243 and MATH 340. Co-requisite: PHYS 206, PHYS 206L, (FALL/SPRING)

CEGR 325 GEOTECHNICAL ENGINEERING FUNDAMENTALS AND LABORATORY - *Two hours lecture, three hours laboratory; 3 credits.* Basic physical and mechanical structural characteristics of geotechnical engineering applied to soil classification, permeability and seepage, in-situ stresses and compressibility, lateral earth pressures, slope stability, and bearing capacity of shallow foundations. (Formerly CEGR 334). Prerequisites: CEGR 212. (FALL/SPRING).

CEGR 332 HYDRAULIC/WATER RESOURCE ENGINEERING - *Three hours lecture; 3 credits.* Includes hydrology; open-channel flow; pipe flow; groundwater flow; dams and reservoirs. Computer programming assignments are incorporated into the coursework. Simulation models and/or optimization methods are used to support analyses of water resource problems,

developing simulation models with the Matlab programming language and solving mathematical optimization problems. Prerequisite: CEGR 214. (FALL/SPRING)

CEGR 338 ENVIRONMENTAL ENGINEERING I AND LABORATORY - *Two hours lecture, three hours laboratory; 3 credits.* The lecture introduces students to the planning and design of elements of water treatment plants and elements of wastewater treatment plants, and the design of sewers and water distribution system hydraulics. The laboratory applies the knowledge of general chemistry to sanitary chemical analyses, which include the various forms of solids, pH measurements, and salinity. The laboratory will also introduce the students to the use of the atomic absorption spectrophotometer. (Formerly CEGR 328). Prerequisites: CHEM 110, CHEM 110L, BIOL 101 and MATH 242 (FALL/SPRING).

CEGR 400 PROJECT MANAGEMENT, FINANCE & ENTREPRENEURSHIP - *Two hours lecture, one-hour practicum; 2 credits.* The principles and techniques of project management in the planning, design, and operation of civil engineering infrastructure and service systems. Specific topics and project management techniques covered include: Project manager and Team building and leadership, Economic analysis in project selection, Project Financing and entrepreneurship, project planning, project organization Project cost estimation, Network analysis and related applications to Project scheduling (i.e. PERT-CPM), Project Monitoring and control using Microsoft project software and project termination process. Prerequisites: ECON 211/ECON 212 and IEGR 251. FALL/SPRING).

CEGR 455 SEEPAGE, DRAINAGE AND GROUNDWATER - *Three hours lecture; 3 credits.* Introduction to groundwater hydrology, well hydraulics, permeability, seepage, flow nets, filter criteria, dewatering, slope stabilization, practical applications. Prerequisite: CEGR 325. (OFFERED AS NEEDED)

CEGR 457 GEOTECHNICAL ENGINEERING - *Three hours lecture, 3 credits.* Geologic overview, site investigations, subsurface stresses and stress path analyses, shear strength and laboratory test, stress-strain relations, application of soil mechanics theories and site improvement, and slope stability analysis. Prerequisite: CEGR 325. (SPRING)

CEGR 458 BIOLOGICAL WASTEWATER TREATMENT - *Three hours lecture; 3 credits.* This course covers the planning and design of the unit operations and unit processes of biological wastewater treatment. Topics include principles of biological treatment; biological lagoons; trickling filter; activated sludge process; anaerobic and aerobic digestion of sludge. Prerequisite: CEGR 332 and CEGR 338. (OFFERED AS NEEDED)

CEGR 459 WATER SUPPLY ENGINEERING - *Three hours lecture; 3 credits.* This course covers planning and design in water supply engineering which includes raw water supply sources, reservoir sizing, pumping and transmission of raw and treated waters, groundwater, distribution systems, treatment processes and chemistry and microbiology of raw and treated waters. Prerequisite: CEGR 332 and CEGR 338. (FALL)

CEGR 460 HAZARDOUS WASTE MANAGEMENT - *Three hours lecture; 3 credits.* This course is an in-depth study of hazardous waste management covering the scientific and engineering principles of hazardous waste management. Specific topics covered include properties, behavior (pathways, fates, and disposition) of hazardous materials in air, groundwater and soil, exposure assessment, regulations, treatment and remediation technologies of hazardous waste materials. Prerequisites: CEGR 332 and CEGR 338. (OFFERED AS NEEDED)

CEGR 463 PHYSICAL - CHEMICAL TREATMENT OF WASTEWATER - *Three hours lecture; 3 credits.* Theory and application of physical and chemical operation and processes for wastewater treatment. Topics and discussion will include sedimentation; flotation; disinfection; coagulation; flocculation; filtration; carbon absorption; reverse osmosis; ion exchange and thickening. Prerequisite: CEGR 332 and CEGR 338. (SPRING)

CEGR 464 ENVIRONMENTAL ENGINEERING II - *Three hours lecture; 3 credits.* This course covers planning and design in environmental engineering which includes environmental engineering hydrology, hydraulics and pneumatics; air pollution control; and solid waste characteristics, management, and control. Prerequisite: CEGR 332 and CEGR 338. (FALL)

CEGR 470 ENERGY EFFICIENCY IN BUILDINGS - *Three hours lecture; 3 credits.* Introduction to principles of energy generation, transport, and storage in building components, materials, and spaces. Concepts of thermal comfort and energy conservation in buildings. Heating, cooling, and air change/quality requirements. Thermal analysis and design of building envelopes. Performance and control of HVAC and other integrated building energy components. Introduction to solar - renewable energy and sustainable building design, analysis, and performance assessment. Prerequisite: PHYS 206, PHYS 206L, and CEGR 400. (OFFERED AS NEEDED)

CEGR 480 FUNDAMENTALS OF GEOGRAPHIC INFORMATION SYSTEMS - *Three hours lecture; 3 credits.* The course provides students with comprehensive knowledge and understanding of Geographic Information Systems (GIS) and its applications in science, technology, engineering and mathematics (STEM). It will cover GIS concepts, principles, and applications. Data acquisition, processing, management, analysis, modeling, and product generation are emphasized. Students will actively participate in data acquisition and mapping. Training in GIS software, including ArcGIS/ArcView, GeoMedia Suite, and Pathfinder Office software will be provided during the course. Term project with oral presentation and written report will form part of this course. Prerequisite: CEGR 110 and CEGR 307. (SPRING).

CEGR 481 FUNDAMENTALS OF REMOTE SENSING - *Three hours lecture; 3 credits.* The course introduces students to sensor systems, basic concepts of Remote Sensing (RS), methodologies and applications in science. Technology, engineering and mathematics (STEM). Aerial photographs and airborne/satellite images will be processed and analyzed. NASA's Mission to Planet Earth and the Earth Observing Systems (EOS) Program will be introduced. Training in RS software, including the environment for visualizing images (ENVI) will be provided. Students will actively participate in data acquisition, ground-truthing/verification, and final product generation/mapping. Term project with oral

presentation and written report will form part of this course. Prerequisite: CEGR 110, and CEGR 307. (FALL).

CEGR 492 SENIOR REVIEW AND PROJECT PROPOSAL - *One-hour lecture, four hours practicum; 2 credits.* This course, typically undertaken in student's penultimate semester, has two parts: (1) Lecture (Senior Project Proposal) - during which student develops, in concert with a faculty advisor (for some projects, it is also desirable that the student select an advisor from industry, in addition to the faculty advisor), the technical proposal for the Senior Design Project, and (2) Practicum - comprehensive review of the Fundamentals of Engineering (FE) civil-discipline-specific examination topics and mock-FE examinations. A brief initial part of the practicum reviews technical report writing and presentation for engineers and development of a design project proposal. Two 4-hour mock-FE exams (simulating the A.M. and P.M. sessions of the FE exam) serve as the program's Comprehensive examination, as well as an assessment of the practicum part of the course. The final grade in the course is a combination of the faculty advisor's evaluation of the student's project proposal effort and written report, and the student's performance in the mock-FE exams and other aspects of the practicum. Prior to this course, the students of junior standing are encouraged, with department approval, to engage in preparation of the project proposal in accordance with the class requirements. Prerequisite: (CEGR 340, CEGR 350, CEGR 360 and CEGR 332) for SUEE or (CEGR 325, CEGR 332, CEGR 338, and CEGR 416) for CE. Co-requisite: (CEGR 400 and IEGR 305) for SUEE or (CEGR 307 and CEGR 436) for CE. (SPRING and FALL)

UEGR 493 SENIOR PROJECT - *Two hours lecture; 1 credit.* This is a follow-up on the proposal developed and approved in CEGR 492 and will focus on the execution of the proposed analysis and design, under the guidance of the same faculty advisor (and external advisor, if any). Specific guidelines on the successful completion of the project should come from the student's faculty advisor. However, this second semester of the two-semester CEGR 492-493 sequence should be spent on finalizing preliminary design and analysis, as well as completion of detailed design and possible optimization, creation of a design project report of acceptable format, conclusion of student's electronic portfolio, and a formal delivery of a PowerPoint (or similar) presentation of the project to an audience of faculty, students and others. The grade for this course is based upon two components: (1) the advisor's assessment of the student's progress through the entire design project and the quality of the written technical report and (2) the department's assessment of the student's up-to-date electronic portfolio; and assessment, by the attending department faculty, of the content and the quality of the presentation made by the student. Prerequisite: CEGR 492. (FALL and SPRING).

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

Group A- General Education and University Requirements

Group A is General Education and University Requirements with a total of 45 credits.

General education requirements are set by the university (Table 3). Students need to take these courses from the relevant departments in various schools. Descriptions of these courses can be found in the department catalogs at Morgan's website: http://www.morgan.edu/academics/academic_catalogs.html

Approved Arts and Humanities Electives (AH) for Group A

As Group A indicated in Table 3, HUMA 201 and PHIL 220 may be substituted by any approved Arts and Humanities Electives (AH) listed in Table 8. Students in SUEE must select two courses from different disciplines shown in Table 8 for a total of 6 credits.

Table 8: Approved Arts and Humanities Electives (AH) for Group A

Course #	Course Title - Approved AH courses	Credit
ART 308	The Visual Arts	3
COMM 203	Media Literacy in a Diverse World	3
HUMA 211	Introduction to Humanities I Honors	3
HUMA 202	Introduction to Humanities II	3
HUMA 212	Introduction to Humanities II Honors	3
HUMA 301	Contemporary Humanities	3
MUSC 391	The World of Music	3
MISC 302	Introduction to Military Training	3
PHEC 300	Selected Roots of Afro-American Dance	3
RELG 305	Introduction to World Religions	3
THEA 312	Black Drama	3
FL 102 +	Foreign Language 102 or higher	3
PHIL 102	Introduction to Philosophy	3
PHIL 220	Ethics and Values	3
PHIL 223	Introduction to the Philosophy of Politics	3
THEA 210	History of the Theater I	3
Remark: total required AH – 6 credits . Students must select two courses from different disciplines in the AH distribution area. The courses in the table may vary with changes in General Education Requirements at MSU		

Approved Social and Behavioral Science Electives (SB) for Group A

HIST 101/105 in Group A (in Table 3) may be substituted by any approved Social and Behavioral Science Electives (SB). Students in SUEE must select two courses from different disciplines listed in Table 9 with a total of 6 credits.

Table 9: Approved Social and Behavioral Science Electives (SB) for Group A

Course #	Course Title -Approved SB courses	Credit
HIST 102	World History II	3
HIST 106	History of the United States II	3
HIST 111	World History I - Honors	3
HIST 112	World History II - Honors	3
HIST 115	History of the United States I- Honors	3
HIST 116	History of the United States II- Honors	3
MHTC 103	Introduction to Group Dynamics	3
MISC 301	Introduction to Team & Small Unit Operations	3
POSC 201	American Government	3
POSC 206	Black Politics in America	3
PSYC 101	General Psychology	3
PSYC 111	General Psychology – Honors	3
SOCI 101	Introduction to Sociology	3

SOCI 110	Introduction to Anthropology	3
SOSC 101	Introduction to the Social Sciences	3
Remark: total required SB – 6 credits . Students must select two courses from different disciplines in the SB distribution area. The courses in the table vary with changes in General Education Requirements at MSU		

Approved Physical Education Electives in Group A

PHEC XXX (Physical Education) in Group A (in Table 3) may be selected from Table 10 approved by the University. SUEE students must select at least one course (one credit) from Table 10 to meet the General Education and University Requirements.

Table 10: Approved Physical Education (PE) Electives in Group A

Course #	Credits	Course #	Credits	Course #	Credits
PHEC 036	1	PHEC 128	1	PHEC 230	1
PHEC 037	1	PHEC 130	1	PHEC 240	1
PHEC 101	1	PHEC 140	1	PHEC 250	1
PHEC 102	1	PHEC 144	1	PHEC 255	1
PHEC 107	1	PHEC 148	1	PHEC 260	1
PHEC 117	1	PHEC 160	1	PHEC 271	1
PHEC 118	1	PHEC 170	1	PHEC 276	1
PHEC 119	1	PHEC 190	1	PHEC 290	1
PHEC 120	1	PHEC 201	1	PHEC 320	1
PHEC 121	1	PHEC 202	1	PHEC 322	1
PHEC 122	1	PHEC 207	1	PHEC 327	1
PHEC 123	1	PHEC 210	1	PHEC 340	1
PHEC 124	1	PHEC 214	1	PHEC 390	1
PHEC 125	1	PHEC 220	1	PHEC 421	1
PHEC 126	1	PHEC 221	1	PHEC 428	1
PHEC 127	1	PHEC 226	1	PHEC 490	1
Remark: total required PE – 1 credits . The courses in the table may vary with General Education Requirements at MSU					

Approved Health and Healthful Living Electives (HH) in Group A

The course HLTH 103 in Group A (in Table 3) may be substituted by any Health and Healthful Living Electives (HH) in Table 11. Students in SUEE must select at least one course from Table 11 for 3 credits to meet the requirement of general education.

Table 11: Approved Health and Healthful Living Electives (HH) in Group A

Course #	Course Title -Approved SB courses	Credit
HLTH 103	Social Determinants of Health	3
NUSC 160	Introduction to Nutrition	3
HLTH 200	Discovering Public Health	3
HLTH 203	Personal and Community Health	3
HLTH 300	Environmental Health Citizenship	3
Remark: total required HH – 3 credits . The courses in the table may vary in accordance with changes in General Education Requirements at MSU.		

Approved Critical Thinking Electives (CT) in Group A

The course PHIL 109 in Group A (in Table 3) may be substituted by any approved Critical Thinking Electives (CT) in Table 12. Students in SUEE must select at least one course from Table 12 for 3 credits to meet the requirement of general education.

Table 12: Approved Critical Thinking Electives (CT) in Group A

Course #	Course Title -Approved SB courses	Credit
PHIL 119	Introduction to Logic Honors	3
COMM 300	Communication and the Black Diaspora	3
ENGR 110	Engineering for Us All	3
MHTC 340	Spirituality and the Helping Tradition	3
PHIL 109	Introduction to Critical Thinking	3
ARCH 105	Place Matters: Introduction to Contemporary City	3
Remark: total required CT – 3 credits . The courses in the table may vary with changes in General Education Requirements at MSU		

Approved Contemporary and Global Issues, Ideas and Values (CI) in Group A

The course HIST350 in Group A (in Table 3) may be substituted by any approved Contemporary and Global Issues, Ideas and Values (CI) in Table 13. Students in SUEE must select at least one course from Table 13 for 3 credits to meet the requirement of general education.

Table 13: Approved Contemporary and Global Issues, Ideas and Values Elective in Group A

Course #	Course Title -Approved CI courses	Credit
HIST 350	Introduction to the African Diaspora	3
HIST 36	Introduction to the African Diaspora	3
WGST 201	Women’s and Gender Studies	3
Remark: total required CI – 3 credits . The courses in the table may be various with General Education Requirements at MSU		

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

After the first student graduates from the program, the SUEE will pursue accreditation through the Engineering Accreditation Commission of ABET as a general engineering program. This will put the program on par with other engineering programs in the School of Engineering. The program educational outcomes, student learning outcomes, curriculum, and assessment procedures are designed to meet ABET requirements. While ABET accreditation is not required, it enhances student eligibility for positions in government and graduate study.

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

Not applicable.

8. *Provide assurance and any appropriate evidence that the proposed program will provide students with clear, complete, and timely information on the curriculum, course and degree requirements, nature of faculty/student interaction, assumptions about technology competence and skills, technical equipment requirements, learning management system, availability of academic support services and financial aid resources, and costs and payment policies.*

The SUEE program will be housed in the Clarence M. Mitchell School of Engineering which has existing undergraduate and graduate programs that meet these requirements. Upon approval by MHEC, the curriculum will be added to the Undergraduate Catalog (<https://catalog.morgan.edu/>) and it will be updated as changes occur, through the existing University process. The program faculty will also develop a student handbook, updated annually, that includes additional details on degree requirements, advising, incoming competencies, and student success. The university has a robust new student orientation program that trains students on the learning management system and ensures that students are aware of how to access resources such as tutoring, financial aid, and the Counseling Center.

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

In keeping with ABET requirements and institutional norms, all student-facing material will be transparent regarding the program including accreditation status, the number of faculty and students, career options, etc. The program will be publicly listed in the Undergraduate Catalog, program handbook, School and Department websites, etc.

H. Adequacy of Articulation

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

There are no existing articulation agreements with this program at partner institutions. The following areas of concentration in the program would be addressed by the following employed faculty.

Drs. Oguntimein, Hunter, and Kang:	Water and wastewater treatment
Drs. Hunter and Kang:	Stormwater management and sustainability
Drs. Kang, Liu, and Li:	Surface and subsurface water pollutant transport
Drs. Owolabi, Kang, and Li:	Solid waste and landfill management

Drs. Owolabi and Li:

Hazardous waste containment

Drs. Liu, Kang, and Li:

Sea level rise, land subsidence, and earth fissure

The faculty listed below will teach existing CEGR courses and new environmental courses developed for the SUEE program in the School of Engineering. No new faculty hires will be needed to teach specialized courses in the program for now.

Table 14: The Faculty List for the SUEE Courses in the School of Engineering.

Name	Appointment Type	Degree & Field	Academic Title/Rank	Status	Concentration
Dr. Li	Tenured	Ph.D. Civil Engineering	Professor	Full-time	hazardous waste containment, geohydro-environmental hazards
Dr. Hunter	Tenured	Ph.D. Civil Engineering	Associate Professor	Full time	stormwater management, urban sustainability
Dr. Owolabi	Tenure track	Ph.D. Civil Engineering	Assistant Professor	Full time	solid waste containment (e.g., landfills)
Dr. Kang	Tenure track	Ph.D. Civil Engineering	Assistant Professor	Full-time	hydro-environmental hazards
Dr. Liu	Tenure Track	Ph.D. Civil Engineering	Assistant Professor	Full-time	geoenvironmental hazards
Dr. Oguntimein	Non-tenure Track	Ph.D. Chemical Engineering	Lecturer	Full-time	physical, chemical, and biochemical processes

MSU has several mechanisms in place for faculty training. There is an annual three-day Faculty Institute that includes faculty pedagogy training at the University, School, and Department levels. Recent topics at this institute have included culturally relevant pedagogy, integration of technology, and Canvas (the LMS). In addition, the Academic Technology Services (ATS) office offers weekly training on the LMS and integrated technology such as Zoom and Panopto. ATS also coordinates training and certification to teach online via Quality Matters.

J. Adequacy of Library Resources:

Students will have access to the Earl S. Richardson Library. The Earl S. Richardson Library is the main academic information resource center on the campus. The building covers approximately 222,517 square feet and opened in 2008. The state-of-the-art building is equipped with state-of-the-art technology, enhanced instruction, and research rooms. It houses over 500,000 volumes and has access to over 160,000 e-books & 5,000 periodical titles. The library subscribes to 167 online databases. Reading and study spaces provide

wired and wireless access to databases for research. As a member of the University System and Affiliated Institutions (USMAI), a statewide library consortium focused on resource sharing and professional capacity development, MSU also has access to the collections of thirteen university libraries in the state of Maryland. A daily delivery between participating libraries is provided to assist patrons in obtaining materials from other library systems. Also, all registered patrons have access to interlibrary loan services, which is a resource-sharing system, for materials not available within the USMAI. The library's physical collection of books in the field of science and technology is typical in scope for a university the size of MSU. This collection is presently serviceable for the instructional and research expectations for this program's majors. To ensure that this collection is more than enough for background reading and research undertakings by students in all this program's core and elective courses, the program's faculty will make requests for acquisitions of relevant additional volumes.

K. Adequacy of Physical Facilities, Infrastructure and Instructional Equipment (as outlined in COMAR 13B.02.03.13)

K-1: Teaching and Research Laboratory Resources

The SUEE program will benefit immensely from the vast laboratory resources available in the Department of Civil Engineering. Based on the current inventory of resources, there is no anticipated critical shortage of teaching and research resources at the initial stages of the development of the new program. Funds generated from research grants will support the maintenance and upgrade of the SUEE laboratory.

1. CE GEOTECHNICAL RESEARCH LABORATORY

This lab focuses on experimental investigation of soil property, in particular, on mechanical behavior of soil, such as deformation and failure under different types of loads. Various factors are considered in the design of various experimental investigations for various types of soils, such as frozen and defrost soils, soils physically reinforced with geofiber, soils chemically stabilized with fly ash or lime, etc. Various tests with different testing conditions can be conducted, such as saturation and consolidation tests, dynamic and static loading tests, resilient modulus tests, resonant column tests, etc. Dynamic loading systems can simulate various types of forces inducted by traffic loads, wind blow, sea waves, earthquakes, foundation vibration, etc. Static loading systems can be applied to various experiments with either stress or strain control to investigate stress-strain relation, soil failure, elastic modulus, and other soil properties. This lab has six new testing systems, including a solid consolidation device, a static triaxial apparatus, two dynamic triaxial testing systems, a soil resonant column, and a triaxial-torsional shear system.

2. CE ENVIRONMENTAL RESEARCH LABORATORIES

Environmental research in the Department of Civil Engineering focuses on the identification of chemical pollutants in water and wastewater, development of innovative physical, chemical, and biological treatment processes, along with the necessary management and decision support strategies for establishing green infrastructure to mitigate impacts that

threaten our water resources. Our academic and research programs also build upon Morgan’s strong interdisciplinary focus on studying the resilience of existing and future water infrastructure, and protection of the ecological services yielded by the Chesapeake Bay Watershed. The environmental labs in CBEIS feature analytical equipment available in two environmental research laboratories, including the latest equipment available from PerkinElmer.

3. CE FLUID MECHANICS RESEARCH LABORATORY

Morgan State University is embarking on cutting-edge research in the areas of heavy lift, fracture mechanics, plasma aerodynamics, and supercavitation. As such, Morgan is fortunate to have approval for additional assets, such as subsonic and supersonic wind tunnels, with access to hypersonic wind tunnels located at the Department of Defense White Oak, Maryland Facility. Moreover, Morgan is a user of NASFRO, ANSYS, FLUENT, CFX, and NASA OVERFLOW2. Finally, Morgan has past experience with NASTRAN.

4. CE GEOSPATIAL TECHNOLOGY LABORATORIES

This lab is for undergraduate research and training in geospatial sciences and technologies. Research focuses on data acquisition, analysis, and synthesis in both STEM and non-STEM disciplines. It is equipped with 20 high-resolution double-monitor workstations, GTICO ACCUTAB digitizer, a wide-format scanner, Trimble Handheld DGPS, a suite of remote sensing and GIS software, and several remotely sensed datasets including Landsat MSS/TM, SPOT, and IKONOS satellites images. This lab is used for the training of graduate students in geospatial technologies and sciences. Students focus on utilizing remote sensing, geographic information system (GIS), and global positioning system (GPS)/differential GPS in their research. It is equipped with 10 high-resolution double-monitor workstations, Leica Total Station for surveying, a 6-panel VisWall state-of-the-art visualization capability, a spectroradiometer for hyperspectral remote sensing, and a suite of GST software including ArcGIS and ENVI. Remotely sensed data sets include both multispectral and hyperspectral satellite images. CE Faculty Geospatial Research Laboratory is dedicated to faculty and collaborators involved in joint research projects utilizing GST. It is equipped with 6 high-resolution double-monitor workstations, a high-resolution HP wide-format plotter, an 18-panel VisWall state-of-the-art visualization capability, an ASD FieldSpect 4 Spectroradiometer for hyperspectral remote sensing, Trimble GeoExplorer 6000 DGPS, and a suite of GST software including ArcGIS and ENVI. Remotely sensed datasets include both multispectral and hyperspectral satellite images.

Table 15: Equipment Available for the SUEE Laboratory

MORGAN STATE UNIVERSITY INVENTORY LIST OF EQUIPMENT IN CBEIS AT-A-GLANCE	Geotechnical	Environmental	Fluid Mechanics	Geospatial	In Progress
GDS Resonant Column Testing System	√				

MORGAN STATE UNIVERSITY INVENTORY LIST OF EQUIPMENT IN CBEIS AT-A-GLANCE	Geotechnical	Environmental	Fluid Mechanics	Geospatial	In Progress
GDS Small-Strain Hollow Cylinder Testing System	√				
GCTS Cyclic Hydraulic Soil Triaxial System	√				
Geocomp Cyclic Triaxial & Resilient Modulus Testing System	√				
Geocomp Triaxial Compression Testing System	√				
Geocomp Rowe Consolidation Testing System	√				
GIS Workstations	√			√	
Conductivity Measurement Device	√				
Direct/Residual Shear Apparatus	√				
RO-Tap Sieve Shakers	√				
Hydrometer Analysis Test (particle gradation through rate of sedimentation)	√				
Constant/Falling Head Apparatus (coefficient of permeability)	√				
Compaction/Proctor Test (moisture-unit weight relationships)	√				
Magnus Test Frame					
Axial Torsion Test Machine					
Biaxial Seismic Simulator (shaking table)					
Universal Testing Machine (includes ASTM testing protocols)					
Pendulum Impact Tester					
Hardness Tester					√
Curing Cabinet/Freeze thaw/Gyrator Compactor					√
Concrete Mixer & Slump Test Apparatus					√

MORGAN STATE UNIVERSITY INVENTORY LIST OF EQUIPMENT IN CBEIS AT-A-GLANCE	Geotechnical	Environmental	Fluid Mechanics	Geospatial	In Progress
Asphalt Oven					√
Air Meter Apparatus (ASTM C231)					√
Concrete Saw/Cylinder Molds/Beam Molds					√
Atomic Absorption (AA) Spectro-photometer with Graphite Furnace		√			
Karl Fischer Tiation Unit		√			
Spectroflurometer		√			
Agilent 1100 HPLC		√			
Chiller, 6000 Series		√			
Combiflash Separation System		√			
Vent Hood/Fume Hood		√			
Thermo Spec Gen 10 Spectro		√			
Agilent 7500 ICP-MS		√			
DO/BOD Meter		√			
Vortex Apparatus (Free and Forced Vortex)			√		
Model Sedimentation Tank			√		
Advanced Hydrology Apparatus			√		
Tilting Flume/Reciprocal sediment loop			√		
GTICO ACCUTAB High-resolution Digitizer				√	
Trimble GeoXH Differential Global Positioning System (DGPS)				√	
ASD FieldSpec Spectroradiometer				√	
18-panel High-resolution VisWall				√	
Leica TS02 TotalStation				√	

Table 16: Software Available in the Civil Engineering Laboratory

SOFTWARE CAPABILITIES (in alphabetical order)	Drafting	Geometrical Modeling	Meshing	Smart Material	Finite Element	Manufacturing	Static Analysis	Nonlinear Time	Computational Fluid Dynamics	Hydro/Aero Dynamic Analysis	Buckling Analysis	Modal Analysis	Fatigue Analysis	Design	Optimization	Mathematical Modeling	Structural Mechanics	Plasma	Fracture	Satellite Orbital Mechanics
ANSYS		√	√	√	√		√	√	√		√	√	√		√		√	√	√	
AQWA			√							√										
ArcView																				
AutoCAD	√	√																		
COMSOL		√	√	√	√		√	√	√		√	√	√				√			
Experience CREO			√		√	√			√								√			
FEMAP	√		√		√				√								√			
FLOWGROW																				√
Maple																√				
Matlab																√				
NASGROW																				√
Origin Lab																√				
Pointwise	√		√		√				√								√			
SAP2000		√	√		√		√	√				√		√						
SPK																				√
Staad		√	√		√		√	√				√		√						

K-2: Library Resources

The Earl S. Richardson Library at Morgan State University and the Engineering Teaching laboratory have an extensive collection of books, journals and magazines, and government documents on civil engineering and related subjects to sustain the needs of the proposed Ph.D. program.

K-3: Other Facilities

The Civil Engineering Department is in the School of Engineering with transportation engineering, electrical engineering, mechatronics engineering, and industrial engineering. A new state-of-the-art building, the Center for Built Environment and Infrastructure Studies (CBEIS), opened in fall 2012, houses research and instructional programs for the School of Architecture and Planning, the School of Engineering’s Civil Engineering, Transportation and Urban Infrastructure Studies Programs, and School of Engineering’s National Transportation Center, in a highly collaborative environment within and among these disciplines. By housing these programs under one roof, CBEIS promotes interactivity among constituent students and faculty from these areas. CBEIS also serves as a laboratory for sustainability in design and engineering. The proposed B.S. in Sustainable Urban Environmental Engineering will symbiotically benefit from the synergy engendered by the union of five closely-related academic disciplines, including resource sharing, and interactions amongst students and faculty in an intellectually stimulating environment.

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

1. Complete Table 17: Resources and Narrative Rationale. Provide finance data for the first five years of program implementation. Enter figures into each cell and provide a total for each year. Also provide a narrative rationale for each resource category. If resources have been or will be reallocated to support the proposed program, briefly discuss the sources of those funds.

Table 17 and Table 18 list the fiscal revenues and expenditures that demonstrate adequate resources for the proposed program. The Department of Civil Engineering can administer most of the proposed program with existing faculty members and the addition of the new professors (to be filled in spring 2023) who have expertise in the relevant subject matter. The addition of a new faculty member allows for ease in implementation of the concentration program. All other administrative and support services will be embedded into the Department’s existing resources.

Table 17: Program Resources

Resource Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. Reallocated Funds	\$0	\$0	\$0	\$0	\$0
2. Tuition/Fee Revenue (c + g below)	\$267,120	\$438,820	\$648,660	\$858,500	\$1,068,340
a. Number of F/T Students	30	45	75	100	125
b. Annual Tuition/Fee Rate	\$7,628	\$7,628	\$7,628	\$7,628	\$7,628
c. Total F/T Revenue (a x b)	\$228,840	\$381,400	\$572,100	\$762,800	\$953,500
d. Number of P/T Students	10	15	20	25	30
e. Credit Hour rate	\$319	\$319	\$319	\$ 319	\$ 319
f. Annual Credit Hour Rate	12	12	12	12	12
g. Total P/T Revenue (d x e x f)	\$38,280	\$57,420	\$76,560	\$95,700	\$ 114,840
3. Grants, Contracts & Other External Sources	\$0	\$0	\$0	\$0	\$0
4. Other Sources	\$0	\$0	\$0	\$0	\$0
TOTAL (Add 1 – 4)	\$267,120	\$438,820	\$648,660	\$858,500	\$1,068,340

The anticipated program resources for the first five years of implementation are outlined in Table 17. Revenue for the program will be driven by tuition, as outlined below. Each resource category is justified separately below:

1. Reallocated Funds: None

2. Tuition/Fee Revenue: Annual Tuition/Fee Rate reflects FY22 approved rates and Credit Hour Rate reflects FY22 part-time undergraduate per credit hour rate. The initial cohort of students to be recruited for the program will be 30 full-time students and 10 part-time students. Annual tuition and fees are calculated based on current rates of \$7,628 for FT students and \$319/credit for 12 credits/year for PT students. The number of enrolled students is anticipated to increase by 40% a year. The initial revenue of \$267,120 is anticipated to increase to \$1.02 million after five years.

3. Grants, Contracts and Other External Sources: None

4. Other sources: None

2. Complete Table 18: Program Expenditures and Narrative Rationale. Provide finance data for the first five years of program implementation. Enter figures into each cell and provide a total for each year. Also provide a narrative rationale for each expenditure category.

Table 18: Program Expenditure

Expenditure Categories	Year 1	Year 2	Year 3	Year 4	Year 5
1. Faculty * (b + c below)	\$0	\$239,700	\$246,891	\$254,298	\$261,927
a. Number of FTE	0	1	1	1	1
b. Total Salary	\$0	\$170,000	\$175,100	\$180,353	\$185,764
c. Total Benefits	\$0	\$69,700	\$71,791	\$73,945	\$76,163
2. Admin. Staff (b + c below)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
a. Number of FTE	1	1	1	1	1
b. Total Salary	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
c. Total Benefits	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
3. Support Staff (b + c below)	\$0	\$70,500	\$70,500	\$70,500	\$70,500
a. Number of FTE	0	1	1	1	1
b. Total Salary	\$0	\$50,000	\$51,500	\$53,045	\$54,636
c. Total Benefits	\$0	\$20,500	\$21,115	\$21,748	\$22,401
4. Technical Support and Equipment	\$0	200,000	0	0	0
5. Library	0	0	0	0	0
6. New or Renovated Space	\$150,000	0	0	0	0
7. Other Expenses	\$5,000	\$5,150	\$5,305	\$5,464	\$5,628
TOTAL (Add 1 - 7)	\$155,000	\$416,650	\$221,035	\$225,551	\$230,203

The anticipated program expenditures are outlined in Table 18. The primary expenditure for the program is the personnel needed for administrative oversight and instruction. Each expenditure category is detailed below:

1. Faculty: In Year 2, two new tenure-track faculty will be hired to teach in the program with a budgeted amount of \$85,000 for two junior faculty (9.5 months). Benefits for each faculty member are calculated at 41% and an annual salary increase of 3% is budgeted.
2. Administrative Staff: One administrative assistant is budgeted for the Department starting in Year 1, with an annual salary of \$50,000. Benefits for the administrative professional is calculated at 41% and an annual salary increase of 3% is budgeted.

3. Support Staff: Admin Staff: N/A: the civil engineering administrative staff will support the proposed program
4. Technical Support and Equipment: In Year 2, \$200,000 is allocated to establish the teaching laboratory for this program. Title III funds will be used for this purpose.
5. Library: None
6. New or Renovated Space: In Year 1, \$150,000 is allocated to renovate existing space to house teaching laboratories for this program. Title III funds will be used for this purpose.
7. Other Expenses: Starting in Year 1, \$5,000 is allocated for program expenditures and supplies. An increase of 3% is budgeted each year.

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

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

Students evaluate instruction in courses through a campus-wide survey administered each semester by the Office of Assessment with results provided to faculty after grade submission. The results from this survey, coupled with the individual annual report and peer evaluations will be used to evaluate faculty effectiveness. Faculty will receive recommendations to university resources when needed.

Student learning outcomes will be evaluated using projects, quizzes, exams, etc. In addition, faculty will develop performance criteria for each outcome that can be used across the program for continuous improvement. This will allow the program to assess how well the students are meeting the outcomes at graduation. This is in keeping with assessment and evaluation procedures in other engineering disciplines.

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

The continuous improvement process for ABET accreditation provides a framework for institutional evaluation of program effectiveness. The program will identify stakeholders that will provide feedback on program educational outcomes, primarily in an advisory capacity. The program is expected to establish a process to monitor student outcomes, set a target for outcomes attainment, and use data to improve these outcomes.

Each Department and School is also expected to submit an annual report that details enrollment, graduation and retention rates, and other program metrics. The Institutional Research Office also provides metrics to administrators for program monitoring and improvement.

N. Consistency with the State's Minority Student Achievement Goals (as outlined in COMAR 13B.02.03.05).

The SUEE B.S. is designed to provide students at Morgan State University, which has a predominant enrollment of African American students, with additional career and professional development opportunities in engineering. In addition, the uniqueness of the program would make it appealing to a broad spectrum of Maryland residents. Thus, the proposed program is consistent with the Commission's minority student achievement goals.

MSU is designated as Maryland's Preeminent Public Urban Research University and plays an important role as the state's leading HBCU and minority-serving institution in providing access to higher education in the STEM fields to residents from the state of Maryland, and broadly to populations of our region and internationally. Morgan fulfills its mission to address the needs and challenges of the modern urban environment through intense community-level study, along with education that addresses urban concerns and pioneering solutions.

Among the nation's most diverse Historically Black Colleges and Universities, and the largest in Maryland, Morgan seeks to ensure that the doors of higher education are opened as wide as possible to as many as possible.

The university has set forth appropriate actions and strategies to recruit and retain underrepresented minority students to accommodate this new program. The university has the following offices in place to support minority student access and success:

- **Office of Undergraduate Admission and Recruitment**, in collaboration with other campus units, strives to attract and enroll qualified, talented, and diverse undergraduate students. The office is committed to providing exceptional service to students and educational partners to highlight Morgan's dedication to excellence.
- **Office of Transfer Student Programming** is responsible for the coordination of and support of students in the Connect program as well as the Tau Sigma National Honor Society. Additionally TSP coordinates and hosts transfer student orientation introducing newly admitted transfer students to support services and university life at Morgan State.
- **Center for Academic Success and Achievement (CASA)** promotes and enhances the academic and personal development of all Morgan State University students through professional academic advice, peer tutoring, and supplemental instruction programs. CASA also runs CASA Academy, a summer bridge program.
- **Office of Student Success and Retention** works in collaboration with all of the academic schools/colleges and the various academic support programs of the University to provide continuous, quality support for undergraduate students from matriculation to graduation. The goal of this comprehensive program is to increase student retention rates and persistence to graduation with a focus on academic success and achievement through early intervention and systematic tracking of undergraduate students.

- **The Office of Strategic Enrollment Partnerships** develops partnerships with the goal of increasing access to college. The office coordinates the University's dual enrollment program, which allows eligible high school students to earn college credit while still in high school.

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

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

This program is not related to an identified low productivity program.

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

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

Distance education at Morgan State University is overseen by Morgan Online, which was established in 2013. This office works closely with Department Chairs and Deans to ensure that the university maintains an attractive suite of online programs and that faculty are certified to teach these courses through Quality Matters. Canvas learning management system is used to deliver Morgan Online courses. Along with Panopto lecture capture, Canvas is used to deliver 24/7 online course instruction to students worldwide. Readspeaker, DocReader, and Closed Captioning for Panopto and Adobe Connect provide accessibility to online courses to all students. Online faculty receive Quality Matters online and hybrid course development training. Quality Matters is a nonprofit organization dedicated to quality assurance in online education. Morgan Online also provides special programming for new students to prepare them for completing their degree online. Most online programs at the university are at the graduate level.

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

Morgan complies with the Council of Regional Accrediting Commissions (C-RAC) guidelines - Interregional Guidelines for the Evaluation of Distance Education. C-RAC guidelines are not related to the proposed BS in SUEE because it is not a distance education program.

References:

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- (9) J. Roy, Engineering By the Numbers, 2019, American Society for Engineering Education. <https://www.asee.org/documents/papers-and-publications/publications/college-profiles/>