THE UNIVERSITY OF NORTH CAROLINA SYSTEM

New Academic Degree Program Request to Establish

Institution: University of North Carolina at Charlotte

Degree Program Title: B.S. in Environmental Engineering

Reviewed and Approved By:

Review	Name	Title
Provost	Joan F. Lorden	Provost and Vice Chancellor for Academic Affairs
Chief Financial Officer	Richard Amon	Vice Chancellor for Business Affairs
Faculty Senate Chair (Or representative)	Susan Harden	President, Faculty Council
Graduate Council (If applicable)	n/a	
Graduate/Undergraduate Dean (If applicable)	John Smail	Associate Provost for Undergraduate Education & Dean of University College
Academic College/School Dean	Robert S. Keynton	Dean of the College of Engineering
Department Head/Chair	John L. Daniels	Department Chair
Program Director/Coordinator	William L. Saunders	Undergraduate Coordinator

New Academic Program Process

New academic programs are initiated and developed by faculty members. The Request to Establish a New Academic Degree Program must be reviewed and approved by the appropriate individuals listed above before submission to the UNC System Office for review.

Please provide a succinct, yet thorough response to each section. Obtain signatures from the Chancellor, Provost, and Chief Financial Officer, and submit the proposal via the PREP system to the UNC System Vice President for Academic Program, Faculty, and Research, for review and approval by the UNC System Office. If the Request to Establish is approved by UNC System Office staff, it will be submitted for review and approval by the UNC Board of Governors.

UNC Institution Name	University of North Carolina at Charlotte
Joint Degree Program (Yes or No)? If so, list partner institution.	No
Degree Program Title (e.g. M.A. in Biology)	B.S. in Environmental Engineering
CIP Code and CIP Title (May be found at National Center for Education Statistics)	Environmental/Environmental Health Engineering (CIP code 14.1401)
Require UNC Teacher Licensure Specialty Area Code (Yes or No). If yes, list suggested UNC Specialty Area Code(s).	No
Proposed Delivery Mode (campus, online, or site-based distance education). Add maximum % online, if applicable.	Campus
If requesting online delivery, indicate if program (or one or more courses) will be listed in UNC Online.	NA
If requesting site-based delivery, indicate address(es), city, county, state, and maximum % offered at site.	NA
Proposed Term to Enroll First Students (e.g. Fall 2022)	Fall 2023

Do the following sections of your previously submitted and approved Request for Preliminary Authorization to Develop a New Academic Degree Program document require any change or updated information? If yes, note the items and explain.

Category	Yes or No	Explanation (if applicable)
SACSCOC Liaison Statement	No	
Review Status (campus bodies that reviewed and commented on Letter of Intent)	No	
Program Summary	No	
Student Demand	No	
Access and Affordability	No	
Societal and Labor Market Demand	No	

Doctoral Specific Questions	NA	

I. Program Summary

a. Describe the proposed program, including the overall rationale for its development. Include a discussion of how this program supports the specific mission of the institution and of the broader UNC System. Why is this program a necessary addition for the institution?

The BS in Environmental Engineering degree seeks to help satisfy the growing demand for licensed environmental engineers in North Carolina's largest metropolitan area, which is a regional hub for manufacturing, industrial and consulting engineering activity. The proposed new curriculum will provide students instruction and design experiences in the core subject matter areas within Environmental Engineering (Water Supply/Wastewater Treatment, Hazardous and Solid Waste, Sustainability, Site Remediation, and Air Quality Engineering) and Water Resources Engineering (Fluid Mechanics/Hydraulics, Groundwater and Surface Water Hydrology, and Stormwater Control). This new BS in Environmental Engineering will complement the existing BS in Civil Engineering degree with another option that provides an applied, hands-on approach to learning to help address technological challenges of the future.

The proposed BS in Environmental Engineering supports UNC Charlotte's institutional mission and will also fully support elements of the broader UNC system mission. Through coursework that combines training in the core subject matter of Environmental Engineering with design experience that runs throughout the curriculum, students will have opportunities to assess, analyze, and solve real-world and locally relevant problems related to contamination of soils, water, and the atmosphere. These pollution prevention and engineering issues are particularly important in North Carolina's largest metropolitan areas. Students will also learn and apply engineering approaches to providing adequate supplies of safe drinking water, and protecting citizens from stormwater flooding and hazardous waste contamination.

This program is an important addition for the institution because it will provide opportunities to engage with the community and work together to solve the unique problems present in a diverse urban environment. For example, one of the Environmental Engineering faculty members, Dr. Mariya Munir, is an expert on the fate and transport of viruses and COVID-19, in particular. Her work with the wastewater testing team for cluster monitoring and control has been featured in scientific journals as well as the popular press (*New York Times*). Graduates from the Environmental Engineering program will be critical, creative, and independent thinkers who will support the interdisciplinary efforts required for the changing environmental needs of society.

b. What are the key objectives of the program? What are the expected benefits for the student who graduates from the program? What are the expected public benefits (at the local, regional, state, or national level) of this program?

The Bachelor of Science in Environmental Engineering (BSEE) Program Educational Objectives (PEO) listed below describe the program's objectives for BSEE graduates three to five years after they have completed the program.

1. BSEE Program graduates will be progressing successfully in their career and exhibiting leadership qualities.

2. BSEE Program graduates will be demonstrating integrity and ethical behavior in all professional activities. Graduates will further demonstrate professionalism by nearing/obtaining professional licensure as appropriate for their chosen career, and by actively participating in professional activities.
3. BSEE Program graduates will be demonstrating their technical ability to solve problems and/or manage engineering solutions from conception through implementation.
4. BSEE Program graduates will be maintaining and expanding professional competencies and mastering emerging technologies by engaging in lifelong learning that includes graduate studies and professional education.
5. BSEE Program graduates will strive to incorporate global, societal, economic, and environmental impacts in their professional work, consistent with the principles of sustainable development.
6. BSEE graduates will be committed to continued engagement and support of the Civil and Environmental Engineering Department and seek opportunities to mentor future engineers.
7. BSEE Program graduates will be engaging and collaborating with the communities in which they live and work.

There are several benefits for a student who graduates from this program. The field of environmental engineering is supported by public sentiment for protecting natural resources, human health and laws targeted at curtailing actions which cause the most severe types of environmental damage. As a result, there is an increasing awareness among students that attracts them to a career where they can have a positive impact on the environment and society. Graduates of the Environmental Engineering program can expect to contribute to economic and social opportunities for our ever-increasing population. Environmental engineers can provide leadership with systems-based solutions to address the need for affordable and clean energy, urban design for sustainable cities and communities, and systems to mitigate climate change. The proposed environmental engineering program will prepare these graduates to be leaders for high-demand, well-paying jobs in North Carolina and beyond. Employment opportunities for these graduates include industry, engineering design firms, local, state, and federal governments, as well as nongovernmental organizations such as energy, manufacturing, and pharmaceutical companies. Strong employment opportunities have been echoed by many local and state engineering design firms, including Brown & Caldwell's Raleigh, NC office: Randy Kabrick from Brown and Caldwell confirmed, "the field has grown and evolved…there is a need for well-trained graduates to serve our clients...there is a demand for graduates of a BSEE program", see Appendix D. According to the 2020 U.S. Bureau of Labor Statistics, the median pay for environmental engineers with a Bachelor of Science degree is $92,120. Graduates of this type of program will also have numerous opportunities to advance their education at the maser's or PhD levels.

From a national perspective, graduates will support several critical infrastructures identified by the White House to be so vital that their breakdown would have a debilitating effect on security, economic development, public health, and safety. Presidential Policy Directive PPD-21 identified key physical infrastructure including Energy, Water and Wastewater systems, and Transportation systems in which environmental engineers "are integral and necessary to maintaining normalcy in daily life." The National Academies of Sciences, Engineering, and Medicine identified the most pressing, interconnected challenges of the 21st century for which "the expertise of environmental engineering will be needed to help resolve or manage." These included: sustainably supply food,

water and energy; curb climate change and adapt to its impacts; design a future without pollution or waste; create efficient, healthy, resilient cities; and to foster informed decisions and actions. Yet, "the ultimate challenge for environmental engineers is to prepare the field to address a new future, because the solutions of the past will not be sufficient to address the problems of the future." Regionally, environmental engineers will be key teammates with industry stakeholders. Duke Energy Senior Vice-President Jessica Bednarcik indicated, "As we shift to new generation resources, environmental engineers will be key teammates to ensure what powers our communities continue to be protective of the public and environment for future generations. Graduates of the program can be a part of a large team that works to maintain compliance with all environmental permits and requirements, work with project managers so there is the right focus on land, water, and habitat conservation during execution of construction projects, and work to lower air emissions throughout service areas", see Appendix E. Locally, environmental engineers will be key teammates with industry stakeholders, such as Charlotte Water. Reliable water and wastewater systems, and management of nutrient pollution that can impact our rivers, lakes, streams, ponds, reservoirs, springs, and wells are critical to the Charlotte area. Processes to protect our drinking water and monitor our water sources are performed by local environmental engineers. Charlotte Water operates three water treatment plants and environmental engineers conduct assessments to determine the susceptibility of all drinking water sources. Charlotte Water Deputy Director, Jacqueline A. Jarrell "believes that environmental engineering will continue to move towards center stage as an engineering discipline due to the need to develop innovative approaches that respond to environmental challenges in the future and the promotion of a circular economy", see Appendix F. The Infrastructure Investment and Jobs Act is a recent federal investment in every sector of American's infrastructure. Environmental engineers will play a critical role, working with the Department of Transportation (DOT), the Department of Energy (DOE), and the Environmental Protection Agency (EPA) to identify and execute needed projects in Charlotte and throughout North Carolina in transportation, clean water, energy, and the resilience and rehabilitation of our natural resources.

II. Program Planning and Unnecessary Duplication:

a. List all other public and private four-year institutions of higher education in North Carolina currently operating programs like the proposed new degree program, including their mode of delivery (use the 4-digit CIP as a guide). Show a four-year history of applications, acceptances, enrollments, and degrees awarded in similar programs offered at other UNC institutions (using the format below for each institution with a similar program). Programs at UNC institutions may be found on the UNC System website.

The public and private four-year institutions of higher education in North Carolina currently operating programs like the proposed new degree program include NC State University and Duke University. The mode of delivery for both is on campus.

Institution	NC State University			
Program Title	Environmental Engineering			
Academic Year	2020-2021	2019-2020	2018-2019	2017-2018
Applications	16	27	27	27
Acceptances	6	15	13	8
New Enrollment	-	-	-	-
Total Enrollment	128	124	118	125
Total Degrees Awarded	35	33	36	27

b. Describe what was learned in consultation with other programs regarding their experience with student demand and job placement. Indicate how their experiences influenced your enrollment projections.

The Civil and Environmental Engineering (CEE) Chair at UNC Charlotte (Dr. John Daniels) consulted with his counterparts at North Carolina State University, Dr. Morton Barlaz, at the University of Texas at Austin (UTA), Dr. Bob Gilbert and at the University of Massachusetts Lowell, Dr. Pradeep Kurup. Collectively these institutions reflect different settings and institutional profiles while yielding similar results for a nationally needed degree such as environmental engineering. These conversations have confirmed student demand and stable program growth. Dr. Barlaz believes that overall student enrollment in his Department of Civil, Construction, and Environmental Engineering (CCEE) would shrink if not for the B.S. Environmental Engineering program. Further, the NC State B.S. in Environmental Engineering program has the largest female enrollment of any engineering discipline. Similarly, Dr. Gilbert notes that 80% of students in the UTA B.S. Environmental Engineering program are female, which, over a span of five years, has raised the overall female proportion of their Department of Civil, Architectural, and Environmental Engineering to 47%. At the University of Massachusetts Lowell, an R2 institution with similar characteristics to UNC Charlotte, their nascent B.S. Environmental Engineering program quickly grew to 56 students within four years. In general, students in the B.S. Environmental Engineering program pursue careers in both environmental and water resources areas. Increasing the participation of women in engineering is essential to supplying the nation's need for engineering talent.

c. Identify opportunities for collaboration with institutions offering related degrees and discuss what steps have been or will be taken to actively pursue those opportunities where appropriate and advantageous.

The CEE department at UNC Charlotte already collaborates with the CCEE department at NC State in terms of career fairs and research; this collaboration will continue. In particular, Charlotte is the largest metropolitan market in either North or South Carolina. Students in NC State's B.S. Environmental Engineering program will be able to participate in UNC Charlotte's job fair (with environmental engineering firms recruiting) and vice versa.

Moreover, Dr. Barlaz has noted that there has been high interest in energy/environment nexus coursework. These courses exist at both institutions and could be offered to students in each other's programs every other semester. This possibility will be actively pursued.

d. Present documentation that the establishment of this program would not create unnecessary program duplication. In cases where other UNC institutions provided similar online, site-based distance education, or off-campus programs, directly address how the proposed program meets unmet need.

The establishment of this new program will not create unnecessary program duplication. The BS degree in Environmental Engineering will be distinct from those already offered in the UNC System in its locale and its focus on the specific educational and environmental needs of the Charlotte region. The BS in Environmental Engineering degree will seek to help satisfy the growing demand for licensed environmental engineers in North Carolina's largest metropolitan area, which is a regional hub for manufacturing and industrial activity. Through coursework that combines training in the core subject matter of Environmental Engineering with design experience that runs throughout the curriculum, students will have opportunities to assess, analyze, and solve real-world and locally relevant problems related to pollution of soils, water, and the atmosphere. These pollution prevention and engineering issues are particularly important in North Carolina's largest metropolitan area. Students will also learn and apply engineering approaches to providing adequate supplies of safe drinking water, protecting citizens from stormwater flooding, and preventing human impacts from hazardous waste pollution. The project work in the curriculum will provide students opportunities to engage with the community and work together to solve the unique problems present in our local diverse urban environment. For example, one of the Environmental Engineering faculty members, Prof. Mei Sun, is a national leader in the field of emerging contaminants in drinking water and air. Prof. Sun has been appointed to the statewide Executive Advisory Committee for the North Carolina Per and Polyfluoroalkyl Substance (PFAS) Testing Network, a multi-institutional research collaborative that organizes millions of dollars in PFAS related research.

Enrollment trends at UNC Charlotte are also differentiators; there are more transfer students at UNC Charlotte than any other school in North Carolina and almost half of the CEE undergraduate population is composed of transfer students. Transfer enrollment has averaged 47.1% over the last seven years within the CEE and is expected to be similar for the new BS in Environmental Engineering program.

e. Admission. List the following:

i. Admissions requirements for proposed programs (indicate minimum requirements and general requirements):

1. Minimum requirements to be admitted directly into Environmental Engineering:

Freshmen

Freshman admission is competitive. Based upon an overall evaluation of high school record with particular emphasis on advanced courses in math and science and SAT or ACT scores, freshmen may be admitted directly to the environmental engineering major. SAT/ACT scores are not required through fall 2024.

- Minimum GPA: n/a
- Pre-Major/Prerequisite Courses: Freshmen MUST present a pre-calculus

equivalent course, a math course during the high school senior year (grade 12/13) or math intensive science course such as physics or chemistry if no math courses are available, with no grades below C in any math courses. Students with AP test scores of at least 3 on AP Calculus AB or BC or early college high school students who present transfer credit for calculus equivalent to MATH 1241 or higher are exempted from having a math course in the senior year.
• Other: Minimum SAT-Math score of 570 or ACT-Math subscore of 23 (not required through fall 2024)
• Declaration of Major: Students may declare the major at time of admission or at any time if in good standing with the College and University.

Transfers

All transfer students will be admitted to the lower division of a department, and evaluation of transfer credits follows the North Carolina articulation agreements. Transfers from an ABET-accredited engineering program who do not meet the GPA requirement may be admitted upon the recommendation of the chair of the major department.
• Minimum GPA: 2.5
• Pre-Major/Prerequisite Courses: Calculus I course (with grade of C or above) equivalent to MATH 1241
• Transferable Credit Hours: 24 credits minimum

Internal Change or Major

Internal change of majors within the College of Engineering must have a minimum GPA of 2.5. Students who do not meet the GPA requirement may be admitted upon the recommendation of the chair of the major department.

2. General Requirements: All students must meet the UNC Charlotte requirements for admission for undergraduate students. If a student does not meet admission requirements to be admitted directly into Environmental Engineering, a student may be admitted as a University College (UCOL) student, once the BSEE Freshman Curriculum is completed with 2.5 GPA or better a student may declare BSEE.

   Admissions to major from UCOL/Other major at Charlotte: Unofficial transcript showing:
   - MATH 1241 completed with C or higher
   - BIOL 1110 completed with C or higher
   - ENGR 1201 completed with C or higher
   - LBST 11XX series completed
   - Social Sci Gen Ed completed
   - MATH 1242 completed with C or higher
   - CHEM 1251 completed with C or higher
   - CHEM 1251L completed with C or higher
   - WRDS 1103 or 1104 completed with C or higher
   - ENGR 1202 C01 completed with C or higher
   - LBST one additional series course completed

ii. Documents to be submitted for admission (listing)

Applications for admission are reviewed when all required credentials are received. The review focuses on the academic history of the applicant and considers all relevant factors. The intent of the University is to offer admission to applicants whose credentials indicate a strong likelihood for success in their selected curricula. Exceptions may be made to the minimum criteria for applicants who are judged to have potential or talent not revealed by test scores and academic performance.

First-Year ("Freshman") Students' Criteria

The Office of Undergraduate Admissions considers applicants whose minimum qualifications include high school graduation or a General Education Diploma (GED). For international applicants, guidelines provided by the American Association of Collegiate Registrars and Admissions Officers (AACRAO) and NAFSA: Association of International Educators and World Evaluation Services are used to determine if an applicant has met requirements for high school graduation in their country.

Applicants for first-year admission must submit the following to complete their application:

1. The online application for admission
2. $75 application fee or approved fee waiver
3. Official high school transcript reflecting completed coursework in grades 9-11. Final transcriptsreflecting senior grades and graduation date must be provided prior to enrollment.
4. Official SAT or ACT scores (optional for 2022).
5. Internationally-educated students must have their foreign credentials translated and evaluatedby an approved, accredited credential evaluation service.

Applicants for freshman admission are evaluated for admission with primary consideration given to the following High School Performance criteria:

- Academic Courses in Grades 9-11. Applicants must have the minimum course requirements as stated by the UNC system. These courses include 4 units of English, 4 units of Math (including anadvanced math), 3 units of Science, 2 units of History/Social Studies, and 2 units of the same foreign language.
- Grade Point Average. The middle 50% of the freshman class has a GPA between 4.0 to 4.49;average GPA is 4.1.
- Senior Year Course Selection. In addition to English and math, we encourage students to take science and foreign languages in their senior year. We expect to see a solid academic schedule, SAT or ACT scores. The middle 50% of the freshman class have SAT scores ranging from 1200 - 1398 and/or ACT scores ranging from 25 - 27.

Transfer Criteria

A minimum of twenty-four semester hours of college transferable coursework is

required for transfer admission. Transfer admission is based on grade point average achieved and specific courses completed. Transfer admission policies are clearly presented on the Undergraduate Admissions website and in the transfer recruitment brochure. In addition, transfer requirements arepresented at community college visits, transfer advising sessions at Open House, and in daily information sessions in the Admissions Office.

In addition to the application and $75 fee, official transcripts from every college attended, and an official high school transcript, the following requirements apply:

- Transfer students under the age of 21 are required to have completed the Minimum Course Requirements in high school: four units of English; 4 units of Math; 3 units of Science; 2 units of Social Science/History; and 2 units of Foreign Language.
- Applicants must present an overall 2.5 grade point average according to calculations performed by the Undergraduate Admissions office.
- Students who do not meet freshman admission requirements must present a minimum of 24 semester hours (or 36 quarter hours) of transfer credits.
- Transfer students applying directly to Civil and Environmental Engineering must have completed a calculus course equivalent to UNC Charlotte MATH 1241.
- Internationally-educated students must have their foreign credentials translated and evaluated by an accredited credential evaluation service. Transfer applicants must have a "course by course report" completed by the service, and they must present the equivalent of a high school diploma in addition to college-transferable coursework.
- Applicants must in good standing at and eligible to return to the last institution attended.
- Transfers from within UNC Charlotte must have a cumulative GPA of 2.5.

f. Degree requirements. List the following:

   i. Total hours required. State requirements for Major, Minor, General Education, etc.
      1. 120 total hours required for Major – See Proposed Degree Plan Appendix C.
   ii. Other requirements: N/A

g. Enrollment. Estimate the total number of students that would be enrolled in the program during the first year of operation and in each delivery mode (campus, online, site, etc.)

	Campus	Online	Site	Full-Time	Part-Time
Year 1	13	N/A	N/A	13	-
Year 3	40	N/A	N/A	40	-
Year 5	60	N/A	N/A	60	-

h. For graduate programs only: N/A

i. For all programs, provide a degree plan showing the sequence of courses to be taken each year. List courses by title and number and indicate those that are required. Include an explanation of numbering system. Indicate new courses proposed.

List of Courses by Title and Number for new BS in Environmental Engineering Program

Note: * designates a new proposed course. All courses listed below will be required.

Calculus I	MATH 1241	3
Principles of Biology	BIOL 1110	3
Introduction to Engineering I	ENGR 1201	2
	LBST 110x Series	3
Social Sci. Gen. Ed.		3
Calculus II	Math 1242	3
Physics I	PHYS 2101	3
Physics I Laboratory	PHYS 2101L	1
Writing and Inquiry in Academic Contexts	UWRT 1103	3
Introduction to Engineering II	ENGR 1202	2
	LBST Series	3
Calculus III	MATH 2241	3
Engineering Mechanics I	MEGR 2141	3
Chemistry I	CHEM 1251	3
Chemistry I Laboratory	CHEM 1251L	1
Engineering Economics	CEGR 2102	3
	LBST 2301	3
Differential Equations	MATH 2171	3
Chemistry II	CHEM 1252	3
Chemistry II Laboratory	CHEM 1252L	1
Surveying and Technical Drawing	CEGR 2103	3
Design Project Laboratory	CEGR 2154	2
Solid Mechanics	MEGR 2144	3
Hydraulics and Hydrology	CEGR 3143	3
Fundamentals of Microbiology	BIOL 2259	3
Geotechnical Engineering	CEGR 3278	3
Geotechnical Laboratory	CEGR 3258	2
Earth Sciences - Geography	ESCI 1101	3
Environmental Engineering	CEGR 3141	3
Environmental Laboratory	CEGR 3155	2
Thermodynamics	MEGR 3111	3
Landfill Design	CEGR 4264	3
Advanced Engineering Hydraulics	CEGR 4146	3
*Construction Engineering	ENVE 3111	2
Probability and Statistics	STAT 3128	3
Water Treatment Engineering	CEGR 4142	3
Sustainability	CEGR 4247	3
Groundwater Resources Engineering	CEGR 4145	3
Energy and the Environment	CEGR 4246	3
*Systems and Design	ENVE 3201	2
Wastewater Treatment Design	CEGR 4242	3
Engineering Hydrology	CEGR 4144	3

Professional Development	ENGR 3295	1
Technical Elective		3
	LBST Series	3

All courses are required. See Appendix G for Academic Plan of Study with Pre/Corequisites

III. Faculty

a. (For undergraduate Program) List of names, ranks, and home department of faculty members who will be directly involved in the proposed program.

Name	Rank	Home Department
Naylor, David W.	Associate Professor of Practice	Civil and Environmental Engineering
Sun, Mei	Assistant Professor	Civil and Environmental Engineering
Saunders, William L.	Lecturer	Civil and Environmental Engineering
Keen, Olya S.	Associate Professor	Civil and Environmental Engineering
Khire, Miland V.	Professor	Civil and Environmental Engineering
Bowen, James D.	Associate Professor	Civil and Environmental Engineering
Weber, Erica	Assistant Teaching Professor	Civil and Environmental Engineering
Warren, Kimberly A.	Associate Professor	Civil and Environmental Engineering
Daniels, John L.	Chair and Professor	Civil and Environmental Engineering
Tempest, Brett Q.	Associate Professor	Civil and Environmental Engineering
Wu, Jy S.	Professor	Civil and Environmental Engineering
Amburgey, James E.	Associate Professor	Civil and Environmental Engineering
Ogunro, Vincent O.	Associate Professor	Civil and Environmental Engineering
Chen, Shen-En	Professor	Civil and Environmental Engineering
Gergely, Ioan	Associate Professor	Civil and Environmental Engineering
Braxtan, Nicole	Assistant Professor	Civil and Environmental Engineering
Muniar, Mariya	Assistant Professor	Civil and Environmental Engineering

b. For doctoral programs: N/A

c. Estimate the need for new faculty for the proposed program over the first four years. If the teaching responsibilities for the proposed program will be absorbed in part or in whole by the present faculty, explain how this will be done without weakening existing programs, and how the current teaching responsibilities of those faculty will be covered.

The program will require a minimum of two net new faculty with a specialization in environmental engineering or water resources, and these can be derived from reallocation of existing faculty resources. Stability in the department and similarity between the B.S. in Civil Engineering and B.S. Environmental Engineering enable the program to be offered with nominal increases in faculty strength. The CEE Department has enjoyed stability and modest growth over the past six years. In the fall of 2016, the CEE program had 437 students (full time and

part time). In the fall of 2021, the program had 498 students. Our number of full-time faculty has not changed (24), although we have three faculty on phased retirement and one who recently left. As such, the department will be replacing a minimum of four faculty members over the next two years. Only one of these positions was in the environmental engineering area. In addition, the department expects to obtain a minimum of one extra faculty as a direct result of funding from the North Carolina General Assembly to the College of Engineering. Entitled "Engineering North Carolina's Future", which includes the provision of new faculty positions:

https://engr.charlotte.edu/news/2022-03-14/engineering-charlottes-and-north-carolinas-future

The CEE department expects to be in a strong position to retain vacant positions and obtain new positions because of its direct contribution to a recent strategic planning effort to grow the research enterprise:

https://research.charlotte.edu/top-tier-research-university

In particular, the department expects investments for its explicit connection with transformational energy, smart and sustainable cities, transportation and advanced mobility, artificial intelligence and nanoscale science and materials. In sum, the department's success with teaching and research will ensure that appropriate faculty are provided, who in turn help the CEE department deliver the BSCE program.

d. Explain how the program will affect faculty activity, including course load, public service activity, and scholarly research.

This program is expected to increase student enrollment. This, combined with the reallocation of existing and expected faculty resources will enable the department to fully utilize its 15,000 square foot environmental research laboratory, which in turn will increase scholarly research. Faculty workload is not expected to change measurably because the number of new courses required (two) is less than the faculty required. There will be an additional administrative burden associated with SACS and ABET accreditation criteria. Initially, the additional responsibility will be carried by three individuals: Dr. Kimberly Warren, Director of Student Learning and Assessment; Dr. Bill Saunders, Undergraduate Director; and Dr. John Daniels: Chair. All three of these professors have experience with assessment and accreditation. By year three we expect program revenues to support the hiring of one additional Tenure Track Faculty member, and one additional Non-Tenure Track Faculty member in the Department of Civil and Environmental Engineering as well as one additional Non-Tenure Track Faculty Member in the Office of Student Development and Success which teaches the first-year courses. These additional faculty will increase scholarly activity and help balance the workload for the increased enrollment and courses.

IV. Delivery Considerations. Provide assurances of the following:

a. *Access* (online, site-based distance education, and off-campus programs). N/A
b. *Curriculum delivery* (online and site-based distance education only). N/A
c. *Faculty development* (online and site-based distance education only). N/A
d. *Security* (online and site-based distance education only). N/A

V. Library

a. Provide a statement as to the adequacy of present library holdings for the proposed program to support the instructional and research needs of this program (this should be developed in consultation with the University Librarian).

Current library holdings are adequate to support student research for this program. Students have access to relevant databases including *ASCE Digital Library, Web of Science, ScienceDirect, ASTM Standards, Agricultural and Environmental Sciences* and many others. The library owns hundreds of thousands of e-books from Springer, Wiley, Elsevier, Cambridge, and other publishers, mostly science and engineering subject matter. The library has current online subscriptions to hundreds of journal titles in this area.

b. If applicable, state how the library will be improved to meet new program requirements for the next four years. The explanation should discuss the need for books, periodicals, reference material, primary source material, etc. What additional library support must be added to areas supporting the proposed program?

The library offers responsive support to research needs of the department. Faculty and graduate student researchers can contact the engineering librarian directly for one-time purchase materials that are needed. For ongoing subscriptions needed, the librarian will work with faculty in the department to prioritize and make requests of the library and university to support new research materials needed to propel the work forward.

c. Discuss the use of other institutional libraries.

The library has a well-received Interlibrary Loan (ILL) department. It is the highest rated service that the library offers. Faculty, students, and staff can make requests through an easy-to-use web interface, with the capability of auto-filling from any of our databases. Book chapters, conference proceedings, and journal articles are scanned and delivered electronically from other institutions as PDF files within 24-48 hours. Print books are mailed and delivered within 5 business days. Any materials that the library is unable to borrow from other libraries will be purchased if available for sale.

d. For doctoral programs, provide a systematic needs assessment of the current holdings to meet the needs of the program.

N/A

VI. Facilities and Equipment

a. Describe the effect of this new program on existing facilities and indicate whether they will be adequate, in year one, five, and ten of the program's operation.
    i. Will any new square footage be required at any point in the first ten years of the program's operation? If so, please provide an overview of requirements, timeline, projected costs, and projected funding sources.
    ii. Will any existing square footage require repair, renovation, or retrofit? If so, please provide an overview of requirements, timeline, projected costs, and projected funding

sources.

The existing facilities will be adequate in year one, five, and ten of the program's operation. New square footage will not be required, and any existing square footage will not require repair, renovation, or retrofit.

b. Describe the effect of this new program on existing technology, information technology, and services and indicate whether they will be adequate, in year one, five, and ten of the program's operation.

The existing technology, information technology, and services will be adequate, in year one, five and ten of the program's operation.

VII. Administration

a. Describe how the proposed program will be administered, giving the responsibilities of each department, division, school, or college. Explain any inter-departmental or inter-unit administrative plans. Include an organizational chart showing the "location" of the proposed new program.

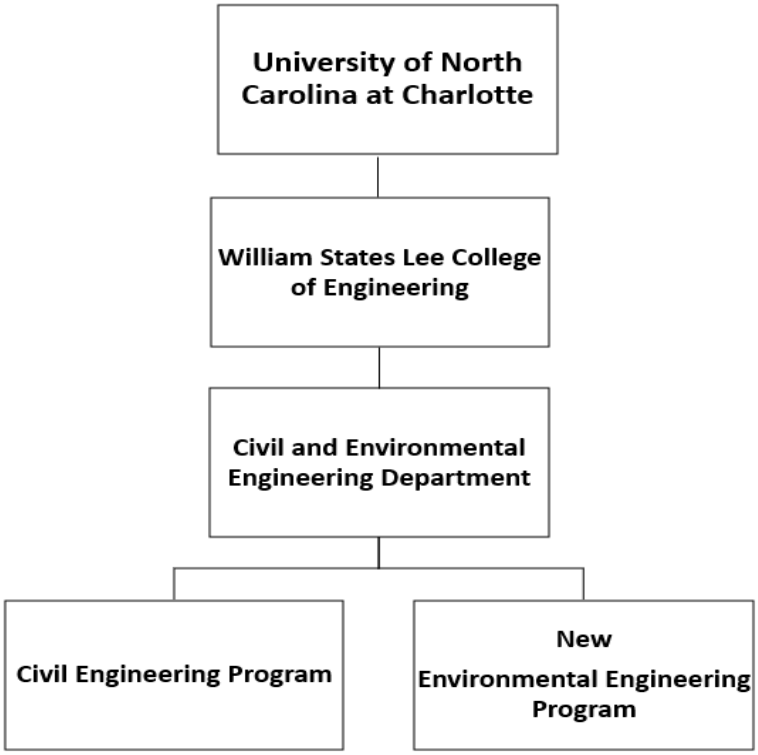
The new Environmental Engineering degree program will be housed in the Civil and Environmental Engineering (CEE) Department and will complement the department's existing BS degree in Civil Engineering. The proposed program will be administered through several existing positions. The current BSCE program director, Dr. Bill Saunders, will also assume the duties of the program director for the BS in Environmental Engineering. As well, the existing Director for Student Learning and Assessment, Dr. Kimberly Warren, will remain in charge of tracking continuous improvement for ABET and SACSCOC accreditation for both programs. There will be no inter-unit administrative requirements. An organizational chart showing the location of the proposed new program is shown below.

b. For joint programs only: N/A

VIII. Additional Program Support

a. Will additional administrative staff, new master's program graduate student assistantships, etc. be required? If so, please describe each item, state the estimated new dollars required at steady state after four years, and state the source of the new funding and resources required.

Organizational Chart for New Environmental Engineering Program



After year three we project enough revenue to support the hiring of new administrative and academic staff to support the program. An Academic Advisor ($58k + fringe), Administrative Assistant ($50k + fringe) and an additional graduate TA ($27,304) to will directly support the Environmental Engineering students and faculty. These salaries represent 13% of new revenue projected from the program at year five.

IX. Accreditation and Licensure

a. Where appropriate, describe how all licensure or professional accreditation standards will be met, including required practica, internships, and supervised clinical experiences.

All licensure and professional accreditation standards will be met through the successful completion of the course

study for the new accredited Bachelor of Science in Environmental Engineering program. Internships, practica, and supervised clinical experiences are not requirements for licensure.

b. Indicate the names of all accrediting agencies normally concerned with programs like the one proposed. Describe plans to request professional accreditation.

The accrediting agency normally concerned with this new program is the Accreditation Board for Engineering and Technology (ABET). To request professional accreditation with ABET, the new program must meet several eligibility requirements, including:

1. Meet ABET'S definition of a program: an integrated organized experience that culminates in the awarding of a degree and must have program educational objectives, student outcomes, a curriculum, faculty, and facilities. The new Environmental Engineering program will meet this requirement.
2. The new program must be housed in a Degree-Granting institution with verifiable and recognized governmental, national, or regional authority to confer degrees. The new Environmental Engineering program will meet this requirement.
3. The name of a program seeking accreditation must be descriptive of the program's content and be stated the same way on the graduate's transcript and in the institution's literature. The Environmental Engineering program will meet this requirement
4. The program must be accreditable under at least one ABET Accreditation Commission; the new Environmental Engineering program is positioned to be assigned to the Engineering Accreditation Commission (EAC).
5. Have at least one graduate: the new Environmental Engineering program must request an initial accreditation Readiness Review upon conferring the first Bachelor of Science degree. This Readiness Review will be completed prior to the academic year when the on-site review occurs. We must inform ABET of the intent of a Readiness Review by September 1 and the deadline for submitting the Readiness Review Report, accompanied with one transcript, must be received by October 1 of the year before we plan to submit the Request for Evaluation.

Upon meeting these initial eligibility requirements, the new Environmental Engineering program will undergo the ABET accreditation evaluation, an 18-month, five step process, including:

1. The Readiness Review; one of the eligibility requirements to help determine whether the program is ready to submit a formal Request for Evaluation (RFE).
2. Request for Evaluation (RFE): must be submitted by January 31 of the year in which the program is seeking an on-site visit. The RFE must be accompanied by one official transcript from a recent program graduate.
3. Self-Study Report: must be submitted to ABET by July 1.
4. The On-Site Visit: are typically scheduled between September and December in the same year of an RFE submission.
5. Due Process and the Accreditation Decision: approximately two to three months after the on-site visit, we will receive a Draft Statement containing a section for each program

reviewed. We will have a 30-day Due Process response period from receipt of the Draft Statement to provide information on actions the programs have taken to resolve any identified shortcomings. The due process review period must be completed before the commission's decision-making meeting in July for the accreditation decision. A Final Statement is prepared and sent to us by August 31. The Final Statement is based on the review team's findings, the program's responses, and communicates the accreditation commission's decision.

c. If the new degree program meets the SACSCOC definition for a substantive change, what campus actions need to be completed by what date to ensure that the substantive change is reported to SACSCOC on time?

N/A

d. If recipients of the proposed degree will require licensure to practice, explain how program curricula and title are aligned with requirements to "sit" for the licensure exam. List what state(s) the institution has determined the program meets professional licensure requirements for and how that information will be communicated to students and prospective students.

If recipients of the proposed degree choose to become licensed to practice, the new accredited program curricula will support the requirements of all states for students to "sit" for the initial licensure exam, the Fundamentals of Engineering Exam (FE). This is a national exam and is the first step in the process to becoming a professional licensed engineer. This information will be communicated to the students throughout their undergraduate experience as follows:

1. Introduction to Engineering I and II (ENGR 1201 and ENGR 1202)
2. Multidisciplinary Professional Development (ENGR 3295)
3. Professional Advising Faculty Panel: meets twice each year to hold a large-group question and answer session for students. Topics include the FE Exam, the PE Exam, and the licensing process

X. Supporting Fields

a. Discuss the number and quality of lower-level and cognate programs for supporting the proposed degree program.

There are 5 lower-level and cognate programs that will support the proposed degree program and include:

i. Chemistry Department:
    1. Chemistry I with Lab I
    2. Chemistry II with Lab II

ii. Mathematics and Statistics Department:
    1. Calculus I
    2. Calculus II
    3. Calculus III
    4. Differential Equations
    5. Statistics for Engineers

iii. Biological Sciences
    1. Principles of Biology
    2. Fundamentals of Microbiology
iv. Geography and Earth Sciences Department
    1. Earth Science course
v. Physics and Optical Sciences Department
    1. Physics I

b. Are other subject-matter fields at the proposing institution necessary or valuable in support of the proposed program? Is there needed improvement or expansion of these fields? To what extent will such improvement or expansion be necessary for the proposed program?

There are 3 other subject-matter fields at the proposing institution necessary in support of the proposed program and includes:

i. General Education:
    a. Liberal Studies: 3 electives
    b. Social Science: 1 elective

There is no needed improvement or expansion of these fields.

XI. Costs, Funding, and Budget

Adding a new degree program will cost the institution some amount of money and will potentially generate new revenues. Calculating the costs and identifying the funding sources associated with implementation of a new program requires several institutional offices (e.g., academic affairs, finance, institutional research, enrollment management) to collaborate to present an accurate estimate.

a. Complete and attach the *UNC System Academic Program Planning Financial Worksheet* showing all costs required and revenues generated for each of the first five years of the program. Provide a budget narrative for each year addressing the following:
    i. UNC Academic Program Costs
    Faculty costs include all faculty assigned to the proposed program, including faculty serving as program directors, coordinators, department chairs, etc., funded in the 101 instructional budget code. If an existing faculty member is reassigned to the program, the salary is reflected as a reallocated cost. New faculty salaries need to be competitive for the discipline, and figures should include all applicable fringe (e.g., retirement, medical). If the proposed program will hire new faculty, it is a new cost.

    Graduate Assistant costs are identified either as new or reallocated, as appropriate, and should include all stipends, tuition remission, and benefits, as applicable.

    EHRA Non-Faculty positions will not be required.

    SHRA Non-Faculty positions will not be required.

    New staff or purchases of new equipment should be adequate to support the stated goals and enrollments for the proposed program. Other program costs identified in the

proposal should be realistic.

The proposed curriculum for the B.S. Environmental Engineering is, except for a two-credit laboratory, already being delivered as part of the existing BS in Civil Engineering (BSCE) curriculum as well as by supporting departments (CHEM 1251 Chemistry I, CHEM 1252 Chemistry II, and BIOL 2259 Fundamentals of Microbiology). The Department of Civil and Environmental Engineering (CEE) is organized into four subdisciplines: Environmental, Geotechnical, Structures, and Transportation. Environmental engineering has long been one of the areas in which BSCE students can concentrate their coursework. A vacant Geotechnical Engineering faculty position will be reallocated to Environmental Engineering. An additional Teaching Assistant is needed as well to support this work.

The number of students expected in year five is 60 and year ten is 118. To meet the growth, program revenues will be used to hire nine new positions to support the program and those departments directly connected to the program. In the Department of Civil and Environmental Engineering we will hire one new tenure track and one new non-tenure track faculty to assist in course delivery and research expansion. In the Department of Civil and Environmental Engineering we will also hire one additional academic advisor to support the additional undergraduate students, and one staff member to support the program and faculty. Finally, to directly support the department we will direct $40,000 in operating funding to the Department of Civil and Environmental Engineering for supplies, materials, travel, communications, and fixed charges. Also, the Special Fee charged to students will be available for additional supplies and materials. Additional revenue generated by the program will be used to fund a new teaching and administrative positions in the Office of Student Development and Success which delivers first-year curriculum and develops outreach and co-op programs for students.

In 2020 the CEE Department recently (2020) streamlined the curriculum and eliminated four of six concentrations in the department, reducing the administrative effort required to monitor progression and completion. The existing BSCE program director (Dr. Bill Saunders) will become the BS in Environmental Engineering program director and the existing Director for Student Learning and Assessment (Dr. Kimberly Warren) will continue to oversee continuous improvement for ABET and SACSCOC accreditation. The Energy Production and Infrastructure Center (EPIC) building that houses the CEE department has the appropriate laboratory space and necessary equipment, although modest costs will be incurred to relocate some faculty research space in Year 1.

In sum, the total costs are estimated as $1,574,124 in Year 5, as detailed in the attached UNC System Academic Program Planning Financial Worksheet.

ii. UNC Academic Program Revenues
Funding sources may include enrollment growth formula funding, other state appropriation, regular tuition, tuition differential, general fees, special fees, reallocation of existing resources, federal funding, and other funding (such as awarded grants or gifts).

The total projected revenue from the above categories should allow the proposed program to become self-sufficient within five years.
When estimating funding for new programs, institutions should take into account that students switching programs do not generate additional enrollment growth formula funds. For example, if a program projects enrollment of 20 students, by 12 of them switched into the program from an existing program at the institution, then only 8 of the students would generate additional formula funding.

Reallocation of Existing Resources includes the salary of faculty reassigned who may be partially or wholly reallocated to the new program. Explain how the current teaching obligations of those faculty are reallocated and include any faculty replacement costs as program costs in the budget. If substantial funds are reallocated, explain how existing undergraduate and graduate programs will be affected.

Federal Funding (In-hand only) refers to federal monies from grants or other sources currently in hand. Do not include federal funding sought but not secured. If anticipated federal funding is obtained, at that time it can be substituted for funds designated in other funding categories. Make note within the text of the proposal of any anticipated federal funding.

Our analysis predicts 60 students in year 5 and 118 students in year ten. Using current rates, the total revenue from enrollment funding, tuition and fees in Year 5 will be $1,574,125, as detailed in the attached UNC System Academic Program Planning Financial Worksheet.

b. Based on the institutions' estimate of available existing resources or expected non-state financial resources that will support the proposed program (e.g., federal support, private sources, tuition revenue, etc.), please describe the following:

    i. How does the institution budget and allocate enrollment growth revenues? Is this program expected to generate new enrollment growth for the institution? If so, how will funds be allocated to the proposed program or be used to further other institutional priorities?

Enrollment growth is expected from the addition of this program. Funds received at the department level will be used in proportion to the enrollment growth.

    ii. Will the institution seek other additional state appropriations (both one-time and recurring) to implement and sustain the proposed program? If so, please elaborate.

The institution will not seek additional state appropriations to implement and sustain the proposed program.

    iii. Will the institution require differential tuition supplements or program-specific fees? If so, please elaborate.

No new fees are requested

1. State the amount of tuition differential or program-specific fees that will be requested.

The existing fee structure ($150 per term) for all engineering programs will be requested for this new program.

2. Describe specifically how the campus will spend the revenues generated.

As with existing programs, the existing fee structure is used to maintain laboratory equipment and computing resources.

c. Provide a description of how the program can be implemented and sustained If enrollment increase funding, differential tuition, or other state appropriations noted in the budget templates are not forthcoming.

This program is not dependent differential tuition or special state appropriations. Since the faculty, courses, equipment, and facilities are in place, the program can be initiated without additional resources and grown with revenue generated by the program. Program expansion would be slowed in the absence of enrollment growth funding to fully support the anticipated demand.

XII. Additional Information. Include any additional information deemed pertinent to the review of this new degree program proposal.

XIII. Attachments. Attach *the UNC System Academic Program Planning Worksheet* as the first attachment following this document (Appendix A and Appendix B), the final approved Request for Preliminary Authorization as the second attachment (Appendix C), followed by any other relevant documents.

Attachment A & B: UNC System Academic Program Planning Worksheet
Attachment C: Request for Preliminary Authorization
Attachment D: Correspondence from Randy Kabrick with Brown & Caldwell, Raleigh, North Carolina
Attachment E: Email Correspondence from Jessica Bednarcik with Duke Energy, Charlotte, North Carolina
Attachment F: Correspondence from Jacqueline A. Jarrell with Charlotte Water, Charlotte, North Carolina
Attachment G: Academic Plan of Study (APS) for BS in Environmental Engineering

XIV. Signatures. This proposal to establish a new program has been reviewed and approved by the appropriate campus committees and authorities and has my support.

Position Title	Signature	Date
Chancellor		12/12/22
Provost		12/12/22
Chief Financial Officer		12/12/22

(Only complete below for partner institution if this is a joint degree program proposal)

Position Title	Signature	Date
Chancellor		
Provost		
Chief Financial Officer		

	Current Program Sources (if applicable)	Rate	Year 0 (Start Up)	1st Year	2nd year	3rd Year	4th Year	5th Year	TOTALS
1	General Fund Appropriation			$ 142,155	$ 143,577	$ 145,012	$ 146,462	$ 147,927	$ 725,133
2	NC Promise Appropriation								$ -
3	*Resident Enrollment (FTE)*								
4	Regular Resident Tuition (Annual Rate)		$ -	$ -	$ -	$ -	$ -	$ -	$ -
5	*Nonresident Enrollment (FTE)*								
6	Regular Nonresident Tuition (Annual Rate)		$ -	$ -	$ -	$ -	$ -	$ -	$ -
7	Tuition Differential (Annual Rate)		$ -	$ -	$ -	$ -	$ -	$ -	$ -
8	Special Fees		$ -	$ -	$ -	$ -	$ -	$ -	$ -
9	External Funding (In-Hand Only)								$ -
10	Other Funding (1x Start Up)			25,000					$ 25,000
11	**Total Current Sources**		$ -	$ 167,155	$ 143,577	$ 145,012	$ 146,462	$ 147,927	$ 750,133
	Proposed New Program Sources								
12	*Incremental Resident SCH*			50	208	543	823	865	
13	Enrollment Funding Appropriation	$ 860	$ -	$ -	$ 21,371	$ 110,940	$ 323,059	$ 587,376	$ 1,042,746
12	*Incremental Resident SCH*			310	482	567	557	785	
13	Enrollment Funding Appropriation	$ 269	$ -	$ -	$ 133,438	$ 340,586	$ 450,958	$ 483,324	$ 1,408,306
14	*Resident Enrollment (FTE)*			12	23	37	46	55	
15	Regular Resident Tuition (Annual Rate)	$ 3,812	$ -	$ 45,592	$ 87,676	$ 140,282	$ 175,352	$ 210,422	$ 659,324
16	NC Promise Appropriation (Resident)		$ -	$ -	$ -	$ -	$ -	$ -	$ -
17	*Nonresident Enrollment (FTE)*			1	2	3	4	5	
18	Regular Nonresident Tuition (Annual Rate)	$ 18,474	$ -	$ 19,213	$ 36,948	$ 59,117	$ 73,896	$ 88,675	$ 277,849
19	NC Promise Appropriation (Nonresident)		$ -	$ -	$ -	$ -	$ -	$ -	$ -
20	Tuition Differential (Annual Rate)		$ -	$ -	$ -	$ -	$ -	$ -	$ -
21	Special Fees	$ 940	$ -	$ 12,220	$ 23,500	$ 37,600	$ 47,000	$ 56,400	$ 176,720
22	External Funding (In-Hand Only)								$ -
23	Other Funding (Identify)								$ -
24	**Total New Sources**		$ -	$ 77,024	$ 302,933	$ 688,524	$ 1,070,265	$ 1,426,198	$ 3,564,944
25	**Total Proposed Program Sources**		$ -	$ 244,179	$ 446,509	$ 833,537	$ 1,216,728	$ 1,574,125	$ 4,315,077

Comments

		Year 0 (Start Up)	1st Year	2nd year	3rd Year	4th Year	5th Year	TOTALS
	Current Program Uses (if applicable)							
1	Tenure/Tenure-Track Faculty		$ 115,916	$ 117,075	$ 118,246	$ 119,428	$ 120,623	**$ 591,288**
2	Non Tenure-Track Faculty							**$ -**
3	Graduate Student Support		26,239	$ 26,501	$ 26,766	$ 27,034	$ 27,304	**$ 133,845**
4	EHRA Non-Faculty Positions							**$ -**
5	Student Support (Scholarships)							**$ -**
6	Libraries							**$ -**
7	Supplies and Materials							**$ -**
8	Travel, Communications, and Fixed Charges							**$ -**
9	Equipment and Technology							**$ -**
10	Facility Repair and Renovation		25,000					**$ 25,000**
11	Other (Identify)							**$ -**
12	**Total Current Uses**	**$ -**	**$ 167,155**	**$ 143,577**	**$ 145,012**	**$ 146,462**	**$ 147,927**	**$ 750,133**
	Proposed New Program Uses							
13	Tenure/Tenure-Track Faculty*				128,877	130,166	131,467	**$ 390,510**
14	Non Tenure-Track Faculty*			116,106	116,729	234,625	236,971	**$ 704,431**
15	Graduate Student Support*				26,766	27,034	27,304	**$ 81,104**
16	EHRA Non-Faculty Positions*				79,070	79,861	289,821	**$ 448,752**
17	Student Support (Scholarships)							**$ -**
18	Libraries							**$ -**
19	Supplies and Materials		$ 3,900	$ 17,500	$ 32,000	$ 35,000	$ 38,000	**$ 126,400**
20	Travel, Communications, and Fixed Charges		$ 1,561	$ 9,996	$ 20,000	$ 20,000	$ 20,000	**$ 71,557**
21	Equipment and Technology		$ 6,240	$ 12,000	$ 19,200	$ 24,000	$ 28,800	**$ 90,240**
22	Facility Repair and Renovation				7,421	17,126	60,761	**$ 85,308**
23	Facility New Construction or Expansion							**$ -**
24	SHRA Non-Faculty Positions		47,042	73,472	89,330	238,637	241,024	**$ 689,505**
24	Other (25% of Enrollment, Tuition, E&T for Central)		18,281	73,858	169,131	263,816	352,049	**$ 877,136**
25	**Total New Uses**	**$ -**	**$ 77,024**	**$ 302,933**	**$ 688,524**	**$ 1,070,265**	**$ 1,426,197**	**$ 3,564,943**
26	**Total Proposed Program Uses**	**$ -**	**$ 244,179**	**$ 446,509**	**$ 833,536**	**$ 1,216,728**	**$ 1,574,124**	**$ 4,315,077**

Comments

Attachment D

Correspondence from Randy Kabrick with Brown & Caldwell, Raleigh, North Carolina

Brown AND Caldwell

5430 Wade Park Blvd
Raleigh, NC 27607

April 3, 2020

Dr. John L. Daniels, P.E.
Professor and Chair
Department of Civil and Environmental Engineering
The University of North Carolina at Charlotte
Charlotte, NC 28223

RE: My Support for a B.S in Environmental Engineering at UNC Charlotte

Dear Dr. Daniels,

Thanks for letting me know that the Department of Civil and Environmental Engineering is seeking authorization to plan and eventually establish a B.S. in environmental engineering. Given the name of your department, its somewhat surprising that this program isn't yet in place.

In my capacity as Vice President at Brown & Caldwell and more than 40 years in the business of environmental engineering, I have had the opportunity to see the environmental engineering field grow and evolve. We need well-trained graduates to serve our clients in the most effective way possible.

It is clear to me that there is demand for graduates of a B.S. environmental engineering program at UNC Charlotte. The addition of this program is long overdue. As a UNCC alumnus (1974), I welcome this addition.

Best regards,

Randy Kabrick, P.E., BCEE, RSM
Vice President

Attachment E

Email Correspondence from Jessica Bednarcik with Duke Energy, Charlotte, North Carolina

From: **Bednarcik, Jessica L** <Jessica.Bednarcik@duke-energy.com>
Date: Wed, Feb 16, 2022 at 5:30 PM
Subject: RE: [EXTERNAL] New Bachelor of Science in Environmental Engineering program at UNC Charlotte
To: Christina Saunders <cpalme21@uncc.edu>

Christina,

Duke Energy is committed to responsible stewardship of the environment. We have a large team that works with our fleet to maintain compliance with all environmental permits and requirements, works with project managers so there is the right focus on land, water, and habitat conservation during execution of construction projects, and works with our operational fleet to lower air emissions throughout our service territories. We have a responsibility to produce and deliver energy that is reliable, affordable, and clean. Research and education on key environmental engineering concepts from institutions like UNC Charlotte will ensure that tomorrow's workers will help us to continue to meet our commitments to the communities where we work and live.

Students who graduate from a program like the one being proposed at UNC Charlotte will be able to enter the workplace with transferrable skills that can be put to use right away as we continue to execute our environmental commitment to customers. As we shift to new generation resources that will enable us to meet our commitment of net-zero carbon emissions by 2050, environmental engineers will be key teammates to ensure that what powers our communities continues to be protective of the public and environment for future generations.

Jessica

Attachment F

Correspondence from Jacqueline A. Jarrell with Charlotte Water, Charlotte, North Carolina

April 14, 2022

Dr. John L. Daniels, P.E.
Professor and Chair
Department of Civil and Environmental Engineering
The University of North Carolina at Charlotte
Charlotte, NC 28223

RE: Bachelor of Science (B.S.) in Environmental Engineering at UNC Charlotte

Dear Dr. Daniels,
I am thrilled to hear that the Department of Civil and Environmental Engineering is seeking authorization to establish a B.S. in Environmental Engineering. With the changes that are happening in our world, there is such a great need for more focus on environmental concerns and how we can protect the environment and hopefully continue to do things to improve it. The need for environmental engineers is critical to finding those solutions and I believe that need will continue to grow with changes we are seeing with climate and natural resources.

I have been with Charlotte Water for over 30 years which has provided me the opportunity to understand the local and regional environment and the role water plays. As a past President of the Water Environment Federation (WEF), a 45000 international water professional member organization, I have also been exposed to global challenges. I have learned about the impacts and the interrelationships of managing resources, protection of the environment, and public health.

I believe that environmental engineering will continue to move towards center stage as an engineering discipline due to the need to develop innovative approaches that respond to environmental challenges in the future and the promotion of a circular economy.

As an alumni and resident of Charlotte, I am very proud of the many accomplishments and the progressiveness of UNC Charlotte. An Environmental Engineering discipline is the perfect complement to the current disciplines at UNC Charlotte and I am excited to support UNC Charlotte's efforts.

Sincerely,

Jacqueline A. Jarrell

Jacqueline A. Jarrell, P.E., WEF Fellow
Deputy Director

Attachment G
Academic Plan of Study (APS) for BS in Environmental Engineering
120 hours required to complete degree
Courses in BOLD require a grade of "C" or better

Course	Pre/Corequisites	Cr. Hrs	Course	Pre/Corequisites	Cr. Hrs
MATH 1241: Calculus I	MATH 1103 or math placement	3	**MATH 1242: Calculus II**	MATH 1241	3
BIOL 1110 Principles of Biology		3	**PHYS 2101: Physics I**	MATH 1241	3
ENGR 1201: Intro to Eng I	Co-req: MATH 1241	2	**PHYS 2101L: Physics I Lab**	Pre/Coreq: PHYS 2101	1
LBST 110X series		3	**UWRT 1103: English**		3
Social Sci. Gen. Ed.		3	**ENGR 1202: Intro to Eng II**	ENGR 1201 with "C" or better	2
		14	LBST Series*		3
					15

Course	Pre/Corequisites	Cr. Hrs	Course	Pre/Corequisites	Cr. Hrs
MATH 2241: Calculus III	MATH 1242	3	**MATH 2171: Diff. Eq.**	MATH 1242	3
MEGR 2141: Eng Mechanics I (Statics)	PHYS 2101 & MATH 1242 with "C" or better	3	**CHEM 1252 Chemistry II**	PHYS 2101 or CHEM 1251	3
CHEM 1251: Chemistry I	MATH 1100 or above	3	**CHEM 1252 Chemistry II Lab**	Pre/Coreq PHYS 2102 or Pre/Coreq CHEM 1252	1
CHEM 1251L: Chemistry I Lab	Pre/Coreq: CHEM 1251	1	**CEGR 2103 Surveying and Technical Drawing**	ENGR 1202 with a grade of C or above	3
CEGR 2102: Eng. Econ.	ENGR 1201 with a grade of C or above	3	**CEGR 2154: Design Project Lab**	CEGR 2102 with a grade of C or above	2
LBST 2301		3	**MEGR 2144: Solid Mechanics**	MEGR 2141 with a C or better	3
		16			15

Course	Pre/Corequisites	Cr. Hrs	Course	Pre/Corequisites	Cr. Hrs
CEGR 3143: Hydraulics & Hydrology	MATH 2171 and MEGR 2141 with grades of C or above	3	**CEGR 3141: Environmental Eng**	MATH 2171, CHEM 1251, CHEM 1251L, & MEGR 2141 with grades of C or above	3
BIOL 2259: Fundamentals of Microbiology	BIOL 1110 and CHEM 1251 with grade of C or above.	3	CEGR 3155: Environmental Lab	Pre/Coreq: CEGR 3141	2
CEGR 3278: Geotechnical Eng.	MATH 2171 and MEGR 2144 with grades of C or above	3	**MEGR 3111 - Thermodynamics**	MATH 2171 & PHYS 2101 with grades of C or above	3
CEGR 3258: Geotechnical Lab	Pre/Coreq: CEGR 3278	2	**CEGR 4264: Landfill Design**	CEGR 3258, CEGR3278 with grade of C or better	3
ESCI 1101-Earth Sciences-Geography		3	**CEGR 4146: Advanced Engineering Hydraulics**	CEGR 3143 with a C or above	3
		14	**ENVE 3111 Construction Engineering**	CEGR 3278 with a C or above	2
					16

Course	Pre/Corequisites	Cr. Hrs	Course	Pre/Corequisites	Cr. Hrs
STAT 3128: Prob &Stat	MATH 2241	3	ENVE 3201: Senior Design	Instructor's approval	2
CEGR 4142: Water Treatment Engineering	CEGR 3141 with a C or above	3	**CEGR 4242: Wastewater Treatment Design**	CEGR 3141 with a C or above	3
CEGR 4247: Sustainability	CEGR 3141 with a grade of C or above	3	**CEGR 4144: Engineering Hydrology**	CEGR 3143 with a C or above	3
CEGR 4145: Groundwater Resources Engineering	CEGR 3143 with a C or above	3	ENGR 3295: Prof Dev		1
CEGR 4246: Energy and the Environment	CEGR 3141 with a C or above	3	Technical Elective		3
		15	LBST Series*		3
					15

New Academic Degree Program Request for Preliminary Authorization

Institution: University of North Carolina at Charlotte

Degree Program Title: B.S. in Environmental Engineering

Reviewed and Approved By (Provide Name and title only. No signature required in this section.)

Review	Name	Title
Provost	Joan F Lorden	Provost and Vice Chancellor for Academic Affairs
Chief Financial Officer	Richard Amon	Vice Chancellor for Business Affairs
Faculty Senate Chair (Or representative)	Susan Harden	President, Faculty Council
Graduate Council (If applicable)	n/a	
Graduate/Undergraduate Dean (If applicable)	John Smail	Associate Provost for Undergraduate Education & Dean of University College
Academic College/School Dean	Robert Keynton	Dean of the College of Engineering
Department Head/Chair	John L Daniels	Department Chair
Program Director/Coordinator	William L Saunders	Undergraduate Coordinator

New Academic Proposal Process

New academic programs are initiated and developed by faculty members. The Request for Preliminary Authorization must be reviewed and approved by the appropriate individuals listed above before submission to the UNC System Office for review.

Please provide a succinct, yet thorough response to each section. Obtain signatures from the Chancellor, Provost, and Chief Financial Officer, and submit the proposal via the PREP system to the UNC System Vice President for Academic Programs, Faculty, and Research, for review and approval by the UNC System Office. If the Request for Preliminary Authorization is approved, the institution may begin work on the formal Request to Establish a New Academic Degree Program.

NOTE: If an institution is requesting preliminary authorization for a degree program at a higher level than

their current Carnegie Classification (e.g. a Master's institution proposing a doctoral degree), then a request for a mission review must first be submitted to the UNC Board of Governors Committee on Educational Planning, Programs, and Policies, through the Senior Vice President for Academic Affairs. If approved by the Board, then the institution may proceed with the Request for Preliminary Authorization.

UNC Institution Name	University of North Carolina at Charlotte
Joint Degree Program (Yes or No)? If so, list partner institution.	No
Degree Program Title (e.g. M.A. in Biology)	B.S.in Environmental Engineering
CIP Code and CIP Title (May be found at National Center for Education Statistics)	Environmental/Environmental Health Engineering (CIP code 14.1401)
Require UNC Teacher Licensure Specialty Area Code (Yes or No). If yes, list suggested UNC Specialty Area Code(s).	No
Proposed Delivery Mode (campus, online, or site-based distance education). Add maximum % online, if applicable.	Campus
Proposed Term to Enroll First Students (e.g. Fall 2022)	Fall 2022

I. SACSCOC Liaison Statement: *(Provide a brief statement from the University SACSCOC liaison regarding whether the new program is or is not a substantive change.)*

The following statement was provided by UNC Charlotte's SACSCOC liaison, Christine Robinson:

- A new program with 50% or more new content (calculated using course credit) is a major change and requires submission and approval of a proposal.
- A new program with 25-49% new content (calculated using course credit) requires a letter of notification and is a minor change.
- Anything less than 25% requires nothing.

The proposed new BS in Environmental Engineering program will be a total of 120 credit hours with one new 2 credit hour course with new content, resulting in 98.3% existing course content and 1.7% with new course content. Therefore, this new program is not substantive and does not require a SACSCOC submission and approval.

II. Program Summary: (*Briefly describe the proposed program and summarize the overall rationale.*) Maximum of 1,000 words.

Include the following in your narrative:

a. How this program supports specific university and UNC System missions.
b. Collaborative opportunities with other UNC institutions as appropriate.
c. Ways in which the proposed program is distinct from others already offered in the UNC System. Information on other programs may be found on the UNC System website, and all similar programs should be listed here (use the 4-digit CIP as a guide).

The University of North Carolina at Charlotte seeks to add a BS degree in Environmental Engineering. The degree program will be housed in the Civil and Environmental Engineering (CEE) Department and will complement the department's existing BS degree in Civil Engineering. The department will obtain accreditation for the new degree from the Accreditation Board for Engineering and Technology, Inc. (ABET). The BS in Environmental Engineering degree seeks to help satisfy the growing demand for licensed environmental engineers in North Carolina's largest metropolitan area, which is a regional hub for manufacturing and industrial activity. A market survey performed by EAB (Appendix A) found that demand for Environmental Engineers within the state is growing at approximately 2.3% per month and currently exceeds that supplied by North Carolina State and Duke Universities, the only two schools in North Carolina that currently offer the Environmental Engineering BS degree. The proposed new curriculum will provide students instruction and design experiences in the core subject matter areas within Environmental Engineering (Water Treatment, Wastewater Treatment, Hazardous and Solid Waste, Air Quality Engineering) and Water Resources Engineering (Fluid Mechanics/Hydraulics, Groundwater and Surface Water Hydrology, Stormwater Control).

The CEE department at UNC Charlotte is well positioned to offer the new BS degree in Environmental Engineering. The department has 25 faculty that provide a well-rounded portfolio of expertise in each area within Civil and Environmental Engineering. Ten of these 25 faculty teach and lead research in Water Resources, Environmental Engineering, and Geo-Environmental Engineering; therefore, the CEE department can offer the new degree with only a modest increase in faculty. The department currently offers an ABET-accredited BSCE degree (Bachelor of Science in Civil Engineering), two Master's degrees (an MS in Civil Engineering degree for students with an undergraduate Civil Engineering degree and an MS in Engineering degree for students with a BS degree in a STEM discipline), and a new PhD degree in Civil Engineering. Since 2004 the department has also been a major participant in the interdisciplinary Infrastructure and Environmental Systems PhD program.

The BS degree in Environmental Engineering will be distinct from those already offered in the UNC System in its locale and its focus on the specific educational and environmental needs of the Charlotte region. The BS in Environmental Engineering will complement the existing BS in Civil Engineering degree by offering a second-degree option that provides the applied, hands-on teaching and learning approach for which the department in known. For 50 years the CEE department at UNC Charlotte has nurtured close working relationships with the local engineering and water resources professional communities. There is an active, vibrant Civil Engineering alumni community in the Charlotte metropolitan area. Alumni and other local professionals are used as guest speakers, mentors, and project reviewers in many of the courses in the Civil Engineering curriculum.

The proposed BS in Environmental Engineering support's UNC Charlotte's institutional mission:

> *"As North Carolina's urban research university, UNC Charlotte is a diverse and inclusive institution with local-to-global impact that transforms lives, communities, and industries through access and affordability, exemplary undergraduate, graduate, and professional programs scholarship, creative work, innovation, and service."*

The BS in Environmental Engineering is also closely aligned with the university vision:

> *To be a globally recognized, emerging top-tier research university driving discovery and innovation, while advancing student access and social mobility, nurturing talent, fostering excellence, and ensuring equity.*

Finally, the new degree also fully supports elements of the UNC system mission, to

- *discover, create, transmit, and apply knowledge to address the needs of individuals and society.*
- *… impart the skills necessary for individuals to lead responsible, productive, and personally satisfying lives, through research, scholarship, and creative activities.*
- *advance knowledge and enhance the educational process; and through public service, which contributes to the solution of societal problems and enriches the quality of life in the State.*

Through coursework that combines training in the core subject matter of Environmental Engineering with design experience that runs throughout the curriculum, students will have opportunities to assess, analyze, and solve real-world and locally relevant problems related to pollution of soils, water, and the atmosphere. These pollution prevention and engineering issues are particularly important in North Carolina's largest metropolitan area. Students will also learn and apply engineering approaches to providing adequate supplies of safe drinking water, protecting citizens from stormwater flooding, and preventing human impacts from hazardous waste pollution. The project work in the curriculum will provide students opportunities to engage with the community and work together to solve the unique problems present in a diverse urban environment. For example, one of the Environmental Engineering faculty members, Dr. Mariya Munir, is an expert on the fate and transport of viruses and COVID-19 in particular. Her work with wastewater testing for cluster monitoring and control has been featured in scientific journals as well as the popular press (*New York Times*).

This new undergraduate program is also seen as a starting point for exceptional students that are interested in advanced graduate studies in Environmental Engineering that could take place in Charlotte or elsewhere. The department has been important source of engineering graduate students for other UNC system schools such as North Carolina State University as well as institutions across the U.S. (e.g., University of Illinois Urbana-Champaign) and abroad, and we expect this will continue once the new Environmental program is added. In addition, the UNC Charlotte faculty have many connections both personal and professional with other Environmental Engineering faculty across the state, nation, and internationally. The Environmental Engineering faculty are highly collaborative serving as PI or co-PI on grants and contracts with faculty from other UNC system schools. As the department grows, we expect these collaborative opportunities will continue to develop.

III. Student Demand: (Provide evidence of student enrollment demand, including external estimates. Discuss the extent to which students will be drawn from a pool of students not previously served by the institution. Maximum length 1,000 words.)

Statewide demand for a bachelor's degree in Environmental Engineering is expected to increase in the coming years. Based upon a market survey performed by EAB (Appendix A), on average, the number of graduates from a bachelor's-level Environmental Engineering program grew 23 percent statewide and 2 percent regionally between the academic years of 2013-2014 and 2017-2018 (see EAB market study, Appendix A). This statewide increase provides an excellent opportunity for a new program at UNC Charlotte as well as another option for North Carolina residents at a state-supported university.

The Civil Engineering discipline has four core areas: Structures, Geotechnical, Transportation and Environmental. Students currently in our Civil Engineering program can focus in any of these four core areas. However, there is a segment of the current student population in UNC Charlotte's Civil and Environmental Engineering department that would have preferred to earn an Environmental Engineering degree but chose to earn a Civil Engineering degree with a focus in the environmental area because an Environmental Engineering degree was not available. This B S in Environmental Engineering degree differs from the B S in Civil Engineering in that it requires more Chemistry and Environmental Engineering coursework and less structural, transportation and mechanics-oriented coursework. Once this program is introduced, a portion of these students could switch to the proposed Environmental Engineering program, especially those with less structures or transportation-based content. In the past, students determined to earn an Environmental Engineering degree had to transfer to another university. Some additional students interested in the environmental area who chose to attend UNC Charlotte have chosen closely related science majors such as Biology, Chemistry, Geology, or Environmental Science. This new degree will provide another option for all these students wishing to earn an ABET accredited Environmental Engineering degree.

To estimate student demand for an Environmental Engineering program at UNC Charlotte, graduation data were collected for the three most recent years available: 2016, 2017 and 2018. Data were collected for 11 schools in the state and region that currently have both an Environmental Engineering and a Civil Engineering degree. A second area of interest for this program and for our department as a whole is student diversity, including racial, ethnic, and gender diversity as well as first-generation college students. In particular, the expected percentage of female students in Environmental Engineering, which has the highest percentage of all Engineering disciplines, is expected to increase the diversity of the undergraduate Engineering programs.[1] Because of the curricular overlap in Civil and Environmental Engineering, we expect the relative size of the two programs and the female student percentage to increase as has been seen at other institutions in the state and region. Our analysis was performed by finding the total number of male and female graduates from eleven programs in the Southeast region of the U.S., the relative sizes of the Environmental and Civil Engineering programs, and the graduation trends (Figure 1).

[1] "Engineering College Profiles and Statistics Book", published by the American Society for Engineering Education

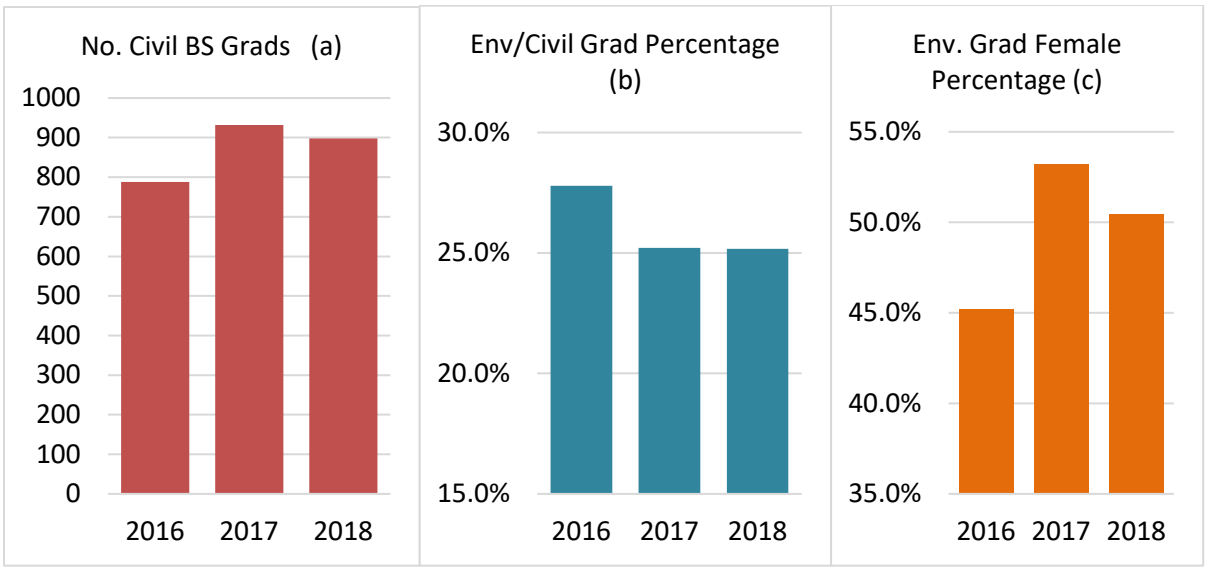


Figure 1. 2016 – 2018 number of BS Civil Engineering graduates (panel A), number of BS Environmental Engineering graduates as a percentage of the Civil Engineering graduate number (panel B), and the percentage of BS Environmental Engineering graduates that are female (panel C) for eleven schools in the Southeast region that currently have both degrees. See Appendix B for the numbers for each school. Data taken from the "Engineering College Profiles and Statistics Book", published by the American Society for Engineering Education.

Findings from this analysis of other schools in the region show that number of graduates each year from Environmental Engineering programs are an average of 26.1% of the graduates in the associated Civil Engineering program; these Environmental Engineering graduates are on average 50% female (Figure 1). Graduates nationwide from Environmental Engineering programs are an average of 48.7% female for the same years (see Appendix B). We believe that enrollment trends for a new Environmental Engineering program at UNC Charlotte are expected to be like those found in these national and regional data.

To apply the trends found in this study, the number of Civil Engineering graduates at UNC Charlotte was collected for the same timeframe. Over these three years, the average enrollment was 452 students, and the average number of graduates was 95 per year. To estimate the size of this new Environmental Engineering program, it has been assumed that once it is established, accredited, and properly marketed, it will be roughly as large on a percentage basis as the other schools in the region that have both Civil and Environmental Engineering programs. We have also assumed that the BS in Environmental Engineering will have the same percentage of female students as the average of the other programs. For this analysis we've also assumed that future enrollment in Civil Engineering at UNC Charlotte, once the new Environmental Engineering program is fully established, will be equivalent to the 2016-2018 average enrollment. Based upon these assumptions, we expect to have approximately 118 students in the Environmental Engineering program (with approximately 59 women and have 25 graduates each year. Taken as a whole, the Civil and Environmental Engineering Department's enrollment will be expected to increase from 452 to 570, with an increase in female students from the current 15% (68 of 452) to 22% (126 of 570). It is expected that the addition of the Environmental Engineering degree will not only grow the department but will also improve the diversity of the student body.

IV. Access, Affordability, and Student Success: (*Provide an analysis of the impact of the program on student access and affordability. Maximum length 1,000 words. Reference sources such as College Scorecard, Census postsecondary outcomes data, etc.)*

a. Analysis of the impact of the proposed program on student access, including key metrics identified in the UNC System Strategic Plan and statewide initiatives (such as myFutureNC).
b. Analysis of student debt levels for similar programs and programs at the same academic level at the institution.
c. Provide an analysis of indebtedness, repayment, and relationship to potential earnings.

As part of UNC Charlotte's Mission Statement, the University envisions "An accessible and affordable quality education…". Participation in the "Higher Expectations Strategic Plan for the University of North Carolina (2017-2022) shows the level of commitment by the university to fulfill this mission. "Higher Expectations" is a five-year strategic plan that sets a series of well-defined, measurable goals in five key areas. Three of those areas are Access, Student Success and Affordability and Efficiency. As part of the UNC Charlotte's high level of commitment to show improvement in these three areas, the University has agreed to nine five-year goals. The goals are to improve Low-income completions, Five-year graduation rates, Undergraduate degree efficiency, Critical workforce credentials, Research productivity, Low-income enrollments, Rural completions, and Achievement gaps in undergraduate degree efficiency, and Rural Enrollments. UNC Charlotte has had success with meeting these goals, as noted in its annual reporting relative to benchmarks, including:

- UNC Charlotte enrolls and graduates the largest number of low-income students in the UNC System
- UNC Charlotte has exceeded its goal to improve five-year graduation rates
- UNC Charlotte continues to improve its undergraduate degree efficiency and is ranked among the highest of UNC System institutions

Policies established by the University to assure Access, Affordability, and Student Success set the working framework of the Department of Civil and Environmental Engineering including the proposed BS in Environmental Engineering degree. For example, community colleges provide local access with an affordable tuition for many students, and transfer students can earn about half of their degree at their local community colleges before transferring to UNC Charlotte. UNC Charlotte enrolls more transfer students than any other school in North Carolina and half of our undergraduate population is made up of transfer students. Enrollment trends are similar in the Civil and Environmental Engineering Department. Transfer enrollment has averaged 47.1% over the last seven years and is expected to be similar in the new BS in Environmental Engineering program.

For 2020 undergraduate graduates at UNC Charlotte, the average indebtedness was $28,050. The national average for public 4-year schools is $28,800. The Department of Education data shows the median indebtedness was $26,000 for UNC Charlotte Civil Engineering undergraduate graduates. From the U.S. Bureau of Labor Statistics, in May 2020, the median annual wage for all workers was $41,950 and $92,120 for those working as

Environmental Engineers. The lowest 10% earned less than $55,450, and the highest 10% earned more than $144,670. A payment of $288.65 per month is needed to satisfy a $26,000 loan at a 6% APR. Repayment of this loan for someone earning a starting salary of $50,600 is about 6.8% of their annual salary and 3.8% for someone earning the median salary of $92,120, making this proposed program an affordable option for students.

Currently there is only one other public option (NC State) for students seeking a Bachelor of Science in Environmental Engineering degree. As the foregoing narrative and admissions data for NC State would suggest, the proposed BS in Environmental Engineering degree will increase both access and affordability in the state's most populous metropolitan region.

V. Societal and Labor Market Demand: *(Provide evidence of societal demand and employability of graduates from each of the following source types. Must include external estimates. Maximum length 1,000 words)*

a. Labor market information (projections, job posting analyses, and wages)
   i. Specific to North Carolina (such as ncworks.gov, nctower.com, or outside vendors such as Burning Glass).
   ii. Available from national occupational and industry projections (such as the U.S. Bureau of Labor Statistics).
b. Projections from professional associations or industry reports (including analysis
c. Other (alumni surveys, insights from existing programs, etc.)

Environmental engineers work in regulatory, compliance, and design functions related to environmental protection of air, water, and soil resources. The drinking water treatment and wastewater treatment sectors are major employers of environmental engineers. Environmental engineers also work to prevent and mitigate flooding, human health, and infrastructure impacts from stormwater. Because their job functions relate to development and maintenance of essential human infrastructure such as drinking water supply and treatment, stormwater collection, wastewater collection and treatment, and housing, societal demand for environmental engineers is robust.

The Occupational Outlook from the Bureau of Labor Statistics (BLS) and a market survey performed by EAB (Appendix A) were used to estimate societal demand for graduates from the proposed BS in Environmental Engineering program on a national and regional basis. The BS degree is considered by the BLS to be the entry-level education requirement. According to the BLS national job outlook, "employment of environmental engineers is projected to grow 5 percent from 2018 to 2028, about as fast as the average for all occupations. State and local governments' concerns regarding water availability and quality should lead to efforts to increase the efficiency of water use." The BLS estimated the median annual wage for environmental engineers to be $92,120 in May 2020.

Societal demand for graduates from the proposed BS in Environmental Engineering was also estimated with an EAB study that surveyed statewide and regional job posting trends, projected employment trends in Environmental Engineering and related fields, and identified the employers and top titles for job postings seeking BS graduates in Environmental Engineering. The EAB study also provided information on statewide and regional

BS-level completions in Environmental Engineering (Appendix A). The EAB study found that on both a statewide (Appendix A, page 2) and regional basis (Appendix A, page 3), job postings for BS-level Environmental Engineers have nearly doubled over the past three years. Over this time, the demand for BS graduates in Environmental Engineering has increased at a rate of 2.3% per month, which exceeds the 1.6% monthly demand growth for all BS-level professionals. The EAB comparison of employment trends found that Environmental Engineering positions are expected to increase 18% statewide and 12% regionally in the next ten years (2018-2028), which compares favorably to the 9% statewide and 10% regional expected increases in employment over the same period for all occupations. A broad set of job titles are available to BS graduates in Environmental Engineering that span many of the disciplines within the proposed curricula. The top employers statewide include many engineering firms such AECOM, S&ME, Kimley-Horn, and Tetra Tech, plus the state of North Carolina and the military. The top industries employing graduates with BS degree in Environmental Engineering include professional, scientific, and technical services, public administration, and administrative, support, waste management, and remediation services (Appendix A).

In summary, societal demand for graduates of the proposed BS in Environmental Engineering is robust. Employment trends in the coming years are favorable and exceed the expected overall employment growth in the next ten years. The healthy overall demand for graduates of the proposed program within the state of North Carolina and in the Southeast region justify the addition of a new BS degree in Environmental Engineering at UNC Charlotte.

VI. Costs, Funding, and Budget: (*Maximum length 1,000 words)*

Adding a new degree program will cost the institution some amount of money and will potentially generate new revenues. Calculating the costs and identifying the funding sources associated with implementation of a new program requires several institutional offices (e.g., academic affairs, finance, institutional research, enrollment management) to collaborate to present an accurate estimate.

a. Complete and attach the UNC System Academic Program Planning Financial Worksheet showing all costs required and revenues generated for each of the first five years of the program. Provide a budget narrative for each year addressing the following:

   i. UNC Academic Program Costs

      Faculty costs include all faculty assigned to the proposed program, including faculty serving as program directors, coordinators, department chairs, etc. funded in the 101 instructional budget code. If an existing faculty member is reassigned to the program, the salary is reflected as a reallocated cost. New faculty salaries need to be competitive for the discipline, and figures should include all applicable fringe (e.g., retirement, medical). If the proposed program will hire new faculty, it is a new cost.

      Graduate Assistant costs are identified either as new or reallocated, as appropriate, and should include all stipends, tuition remission, and benefits, as applicable.

EHRA Non-Faculty positions include non-instructional academic support costs directly associated with running the program, including amounts associated with the Dean's office, research support, etc. This should include salaries and all applicable fringe.

SHRA Non-Faculty positions includes all positions specific costs associated with the new program. This includes the additional staff needed to organize applications, prepare for the proposed program, and for general administration of the proposed program. New staff or purchases of new equipment should be adequate to support the stated goals and enrollments for the proposed program. Other program costs identified in the proposal should be realistic.

The proposed curriculum for the B.S. Environmental Engineering is, except for a two-credit laboratory, already being delivered as part of the existing B.S. Civil Engineering (BSCE) curriculum as well as by supporting departments (CHEM 1252 Chemistry II, CHEM 2131 Organic Chemistry, and BIOL 2259 Fundamentals of Microbiology). The Department of Civil and Environmental Engineering (CEE) is organized into four subdisciplines: Environmental, Geotechnical, Structures, and Transportation. Environmental engineering has long been one of the areas in which BSCE students can concentrate their coursework. A vacant Geotechnical Engineering faculty position will be reallocated to Environmental Engineering. This is possible because there are enough Geotechnical Engineering faculty (Five - Drs. John Daniels, Rajaram Janardhanam, Milind Khire, Vincent Ogunro, and Kimberly Warren) to adequately cover the coursework needed (nine courses per semester) in that area. The reallocated position may be used to teach the needed two-credit course laboratory in hydrology/water resources, or to free an existing member of the Environmental Engineering group (Drs. James Amburgey, Jim Bowen, Mariya Munir, Bill Saunders, Mei Sun, and Jy Wu) to do so. An additional Teaching Assistant is needed as well to support this work.

The increase in students (~25%) and complexity of the program (118/120 credit hours same as existing) is relatively low. Thus, no new EHRA non-faculty positions, SHRA non-faculty positions, libraries, supplies, materials, travel, equipment, or facilities are required. In addition, the CEE Department recently (2020) streamlined the curriculum and eliminated four of six concentrations in the department, reducing the administrative effort required to monitor progression and completion. The existing BSCE program director (Dr. Bill Saunders) will become the BS in Environmental Engineering program director. The existing Director for Student Learning and Assessment (Dr. Kimberly Warren) will remain in charge of tracking continuous improvement for ABET and SACSCOC accreditation. The Energy Production and Infrastructure Center (EPIC) building that houses the CEE department has the appropriate laboratory space and necessary equipment, although modest costs will be incurred to relocate some faculty research space in Year 1.

In sum, the total costs are estimated as $711,111 over five years, as detailed in the attached UNC System Academic Program Planning Financial Worksheet.

ii. UNC Academic Program Revenues

Funding sources may include enrollment growth formula funding, other state appropriation, regular tuition, tuition differential, general fees, special fees, reallocation of existing resources, federal funding, and other funding (such as awarded grants or gifts). The total projected revenue from the above categories should allow the proposed program to become self-sufficient within five years.

When estimating funding for new programs, institutions should consider that students switching programs do not generate additional enrollment growth formula funds. For example, if a program projects enrollment of 20 students, but 12 of them switched into the program from an existing program at the institution, then only 8 of the students would generate additional formula funding.

Reallocation of Existing Resources includes the salary of faculty reassigned who may be partially or wholly reallocated to the new program. Explain how the current teaching obligations of those faculty are reallocated and include any faculty replacement costs as program costs in the budget. If substantial funds are reallocated, explain how existing undergraduate and graduate programs will be affected.

Federal Funding (In-hand only) refers to federal monies from grants or other sources currently in hand. Do not include federal funding sought but not secured. If anticipated federal funding is obtained, at that time it can be substituted for funds designated in other funding categories. Make note within the text of the proposal of any anticipated federal funding.

Our analysis predicts a net increase of 118 students. Using current rates, the total revenue from tuition and fees over five years is computed as $4,417,920, as detailed in the attached UNC System Academic Program Planning Financial Worksheet.

b. Based on the institution's estimate of available existing resources or expected non-state financial resources that will support the proposed program (e.g., federal support, private sources, tuition revenue, etc.), please describe the following:

i. How does the institution budget and allocate enrollment growth revenues? Is this program expected to generate new enrollment growth for the institution? If so, how will funds be allocated to the proposed program or be used to further other institutional priorities?

Enrollment growth is expected from the addition of this program. Funds received at the department level will be used in proportion to the enrollment growth.

ii. Will the institution seek other additional state appropriations (both one-time and recurring) to implement and sustain the proposed program? If so, please elaborate.

No.

iii. Will the institution require differential tuition supplements or program-specific fees?

No new fees are requested.

1. State the amount of tuition differential or program-specific fees that will be requested.

   The existing fee structure ($150 per term) for all engineering programs will be applied to this new program.

2. Describe specifically how the campus will spend the revenues generated.

   As with existing programs, the existing fee structure is used to maintain laboratory equipment and computing resources.

c. Provide a description of how the program can be implemented and sustained If enrollment increase funding, differential tuition, or other state appropriations noted in the budget templates are not forthcoming.

   This program is not dependent differential tuition or special state appropriations. Since the faculty, courses, equipment, and facilities are in place, the program can be initiated without additional resources. Program expansion would be slowed in the absence of enrollment growth funding to fully support the anticipated demand.

VII. Contact: (List the names, titles, e-mail addresses and telephone numbers of the person(s) responsible for planning the proposed program.)

Position Title	Name	E-mail Address	Telephone
Professor, Department Chair	John L Daniels	jodaniel@charlotte.edu	704-687-1219
Undergraduate Director and Lecturer	William L Saunders Jr	wlsaunde@charlotte.edu	707-687-1234

Signatures. This Request for Preliminary Authorization has been reviewed and approved by the appropriate institutional committees and authorities and has my support.

Position Title	Signature	Date
Chancellor	John L. Dahm	2/9/22
Provost	Joan F. Lorden	2/8/2022

(Only complete below for partner institution if this is a joint degree program proposal)

Position Title	Signature	Date
Chancellor	n/a	
Provost	n/a	

Cost Category *	Cost Sub-Category	Start-up Costs **	1st Year	2nd year	3rd Year	4th Year	5th Year	TOTALS
Tenure/Tenure-Track Faculty	New							$ -
	Reallocated		$ 115,916	$ 117,075	$ 118,246	$ 119,428	$ 120,623	$ 591,288
Non Tenure-Track Faculty	New							$ -
	Reallocated							$ -
Graduate Student Support	New							$ -
	Reallocated		$ 18,589	$ 18,775	$ 18,963	$ 19,152	$ 19,344	$ 94,823
EHRA Non-Faculty Positions	New							$ -
	Reallocated							$ -
SHRA Non-Faculty Positions	New							$ -
	Reallocated							$ -
Student Support (Scholarships)								$ -
Libraries								$ -
Supplies and Materials								$ -
Travel, Communications, and Fixed Charges								$ -
Equipment and Technology								$ -
Facility Repair and Renovation			$ 25,000					$ 25,000
Facility New Construction or Expansion								$ -
Other (Identify)								$ -
TOTALS			$ 159,505	$ 135,850	$ 137,209	$ 138,581	$ 139,966	$ 711,111

* For personnel, include all salary and benefit expenses

** For start-up costs, include all costs incurred prior to the first year of student enrollments

1 tenure track position, 1 graduate TA position

Only new course is CEGR 4090

Revenue Category	Year 0 (Start Up) **	1st Year	2nd year	3rd Year	4th Year	5th Year	TOTALS
Enrollment Funding Formula Appropriation (FTE or SCH) *				$ -	$ -	$ -	$ -
Regular Tuition		$ 449,816	$ 449,816	$ 449,816	$ 449,816	$ 449,816	$ 2,249,080
Tuition Differential							$ -
Reallocation of Existing Resources							$ -
External Funding (In-Hand Only)							$ -
Special Fees		$ 35,400	$ 35,400	$ 35,400	$ 35,400	$ 35,400	$ 177,000
Other Fees (Identify)		$ 398,368	$ 398,368	$ 398,368	$ 398,368	$ 398,368	$ 1,991,840
Other Funding (Identify)							$ -
TOTALS		$ 883,584	$ 883,584	$ 883,584	$ 883,584	$ 883,584	$ 4,417,920

* Enrollment growth funding appropriation should not be included in the first two years of the program.

**** Funds identified to cover expenses prior to student enrollment**

Expect 118 new students (1906/semester...2 semesters/year) 12 credit hours

Following tuition rates, assume all in-state, college of engineering fee of 150 for "special fee"

other fees

Education and Tech	311
Safety and Security	17
University Fees	1097
49er Card	7.5
UNC System Fee	0.5
Food Services Facilitie	10
Transportation	77.5
Health Services	167.5
Total	1688

Market Pulsecheck

An evaluation of employer demand for graduates from the proposed bachelor's-level environmental engineering program in North Carolina and regionally and student demand for similar programs.

Analysis Includes:

- Job Posting Trends
- Top Titles
- Top Employers
- Top Industries
- Degree Completion Trends

Options for Next Steps

Following this analysis, the requesting partner can:

- Choose to discontinue the research, if the leadership is able to make a decision based on this analysis and other institutional research.
- Continue the analysis. A final report of the continued research will address credential design and curricular recommendations.

Analysis Suggests Favorable Program Potential

Preliminary Program Outlook

Employer demand trends and occupational outlook indicate need for program graduates. Statewide employer demand for bachelor's-level environmental engineering professionals increased at an average monthly rate of 2.3 percent from February 2017 to January 2020, above the average growth rate for all bachelor's-level professionals (i.e., 1.6 percent). Additionally, the relatively high volume of relevant job postings (i.e., 2,980 in the past year) suggests strong employment opportunities for bachelor's-level environmental engineering professionals statewide. Regional employer demand for bachelor's-level environmental engineering professionals increased at a rate above the average for all bachelor's-level professionals from February 2017 to January 2020 (i.e., 2.0 percent and 1.3 percent, respectively). Further, growth in employment for all the top five relevant statewide occupations and four of the five relevant regional occupations is projected to outpace the average growth in employment for all occupations.

A new bachelor's-level environmental engineering program would encounter increasing student demand statewide, indicating a potential opportunity for program development. Statewide completions of bachelor's-level environmental engineering programs grew 23 percent per year on average between the 2013-2014 and 2017-2018 academic years, while the number of institutions reporting bachelor's-level environmental engineering completions increased only eight percent. Further, with new entrants to the market, market share has begun to become more evenly distributed, with the institutional leader, North Carolina University at Raleigh, losing over 20 percentage points of market share since the 2013-2014 academic year. Comparatively, regional completions increased two percent per year between the 2013-2014 and 2017-2018 academic years, while the number of institutions reporting bachelor's-level environmental engineering completions increased five percent. This indicates new programs may have a challenging competitive landscape regionally. The increase in the median number of completions per institution from 18.5 in the 2013-2014 academic year to 21.0 in the 2017-2018 academic year, however, indicates the market is not dominated by a few large institutions and new entrants to the market may be able to capture enrollments.

Research Limitations

Job postings reflect positions for which bachelor's-level environmental engineering professionals qualify; however, occupational projections refer to changes in employment within occupations, not just positions relevant to bachelor's-level environmental engineering professionals. Occupational data may overestimate the number of future positions available to bachelor's-level environmental engineering professionals.

Statewide Analysis of Job Postings for Bachelor's-Level Environmental Engineering Professionals

Statewide employer demand trends and employment projections indicate need for program graduates. Relevant statewide employer demand for bachelor's-level environmental engineering professionals grew 2.3 percent per month on average between February 2017 and January 2020, faster than the growth in statewide demand for all bachelor's-level professionals. Further, the high volume of relevant job postings (i.e., 2,980 postings in the past year) suggests strong employment opportunities for bachelor's-level environmental engineering professionals.

+2.3%

Average Monthly Demand Growth

February 2017 – January 2020, Statewide Data

- Average monthly growth of 10 job postings
- During the same period, demand for all bachelor's-level professionals grew 1.6 percent

543 job postings

Average Monthly Demand

February 2017 – January 2020, Statewide Data

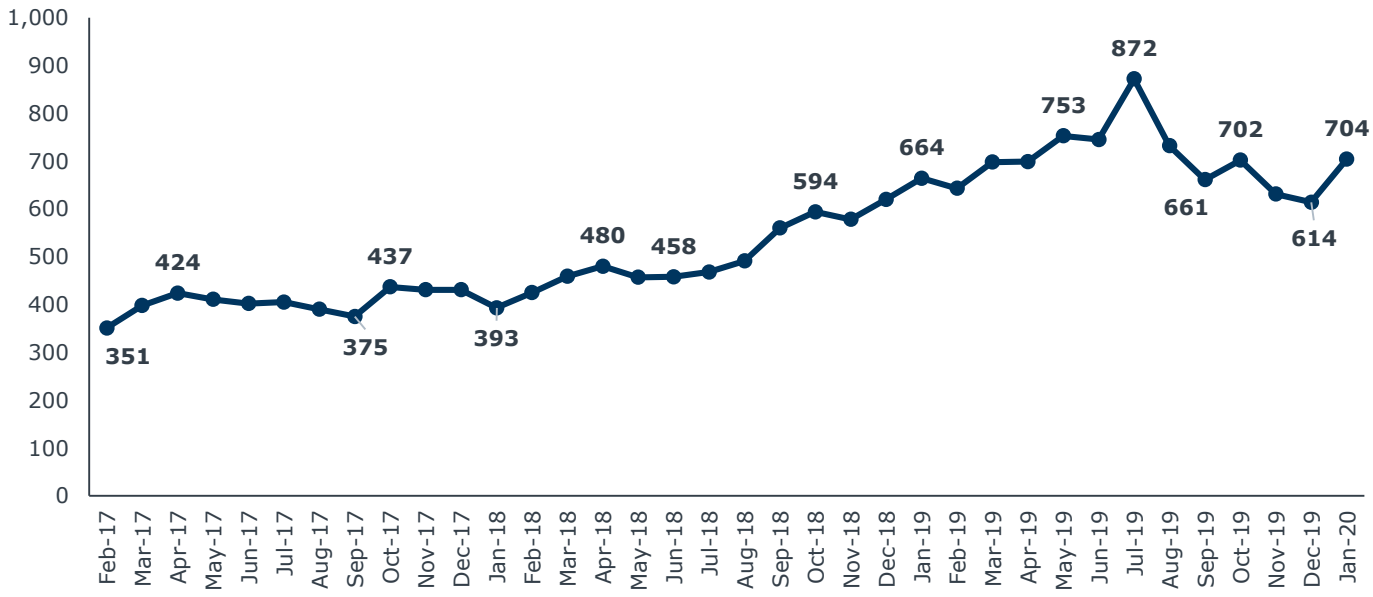
2,980 job postings

Relevant Jobs Posted in the Past Year

February 2019 – January 2020, Statewide Data

Job Postings for Bachelor's-Level Environmental Engineering Professionals over Time

January 2017 – December 2019, Statewide Data



Source: EAB analysis. Emsi Analyst.

Regional Analysis of Job Postings for Bachelor's-Level Environmental Engineering Professionals

Regional employer demand trends and employment projections indicate need for program graduates. Relevant regional employer demand for bachelor's-level environmental engineering professionals grew 2.0 percent per month on average between February 2017 and January 2020, faster than the growth in regional demand for all bachelor's-level professionals. Further, the high volume of relevant job postings (i.e., 14,476 job postings in the past year) suggests strong employment opportunities for bachelor's-level environmental engineering professionals.

+2.0%

Average Monthly Demand Growth

February 2017 – January 2020, Regional Data

- Average monthly growth of 50 job postings
- During the same period, demand for all bachelor's-level professionals grew 1.3 percent

2,569 job postings

Average Monthly Demand

February 2017 – January 2020, Regional Data

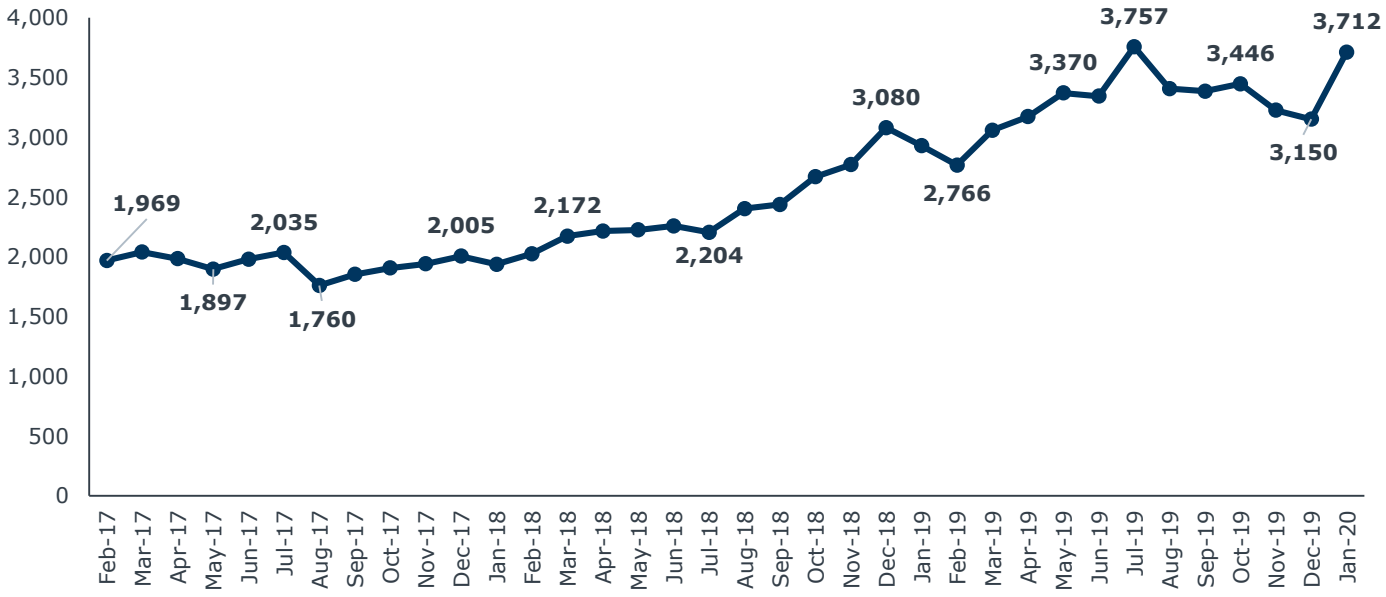
14,476 job postings

Relevant Jobs Posted in the Past Year

February 2019 – January 2020, Regional Data

Job Postings for Bachelor's-Level Environmental Engineering Professionals over Time

February 2017 – January 2020, Regional Data



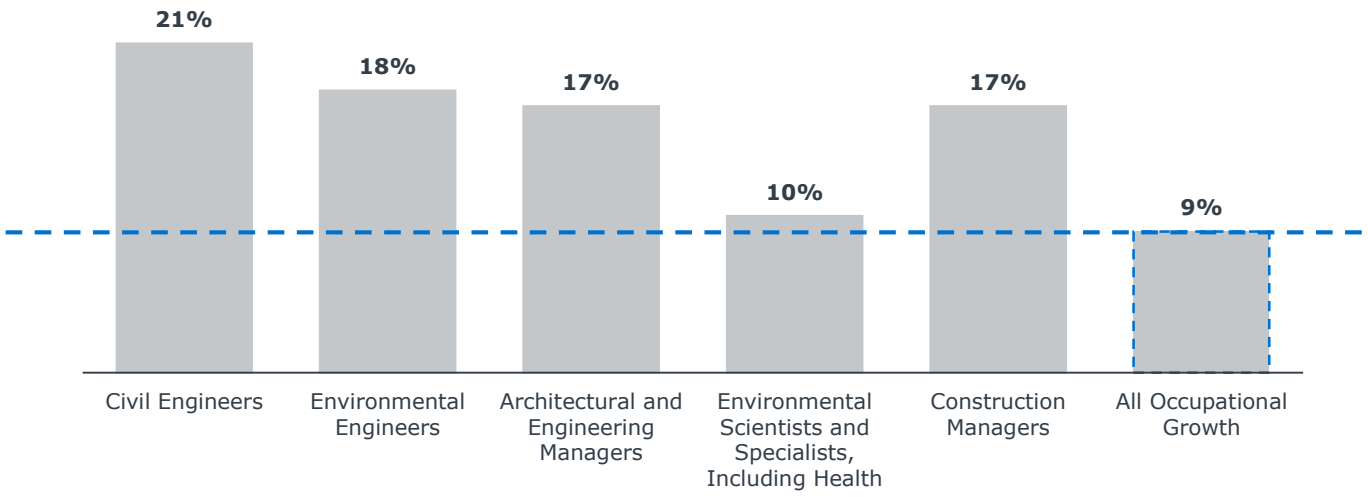
Source: EAB analysis. Emsi Analyst.

Analysis of Employment for Bachelor's-Level Environmental Engineering Professionals

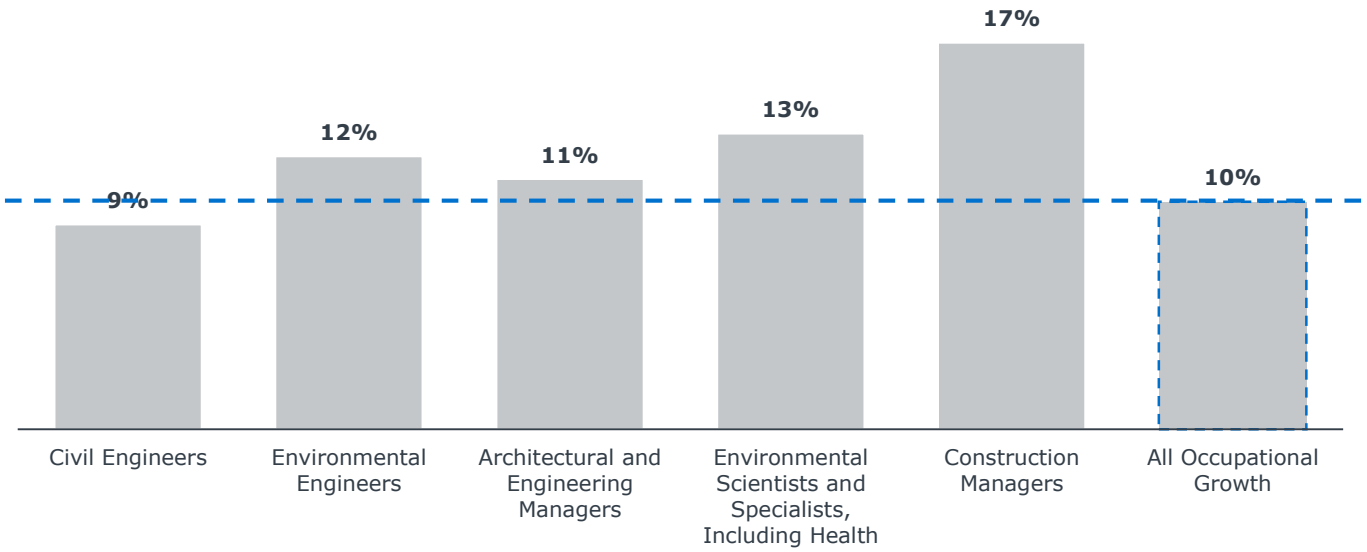
Statewide, employment for the top five most frequently posted relevant occupations is projected to increase faster than the average for all statewide occupations. Notably, employment of "civil engineers" is projected to grow at a rate 12 percentage points above the statewide average. Regionally, employment of the top five occupations is projected to grow faster than the average of all regional occupations, with the exception of "civil engineers," which is projected to increase only nine percent.

Projected Employment in Top Occupations[1]

2018-2028, Statewide Data



2018-2028, Regional Data



1) Top occupations refer to the occupations in which employers most often seek relevant professionals. The graph orders the top five relevant occupations from left to right (i.e., the occupation with the most statewide and regional job postings is "civil engineering" and the occupation with the fifth highest number of job postings is "construction managers").

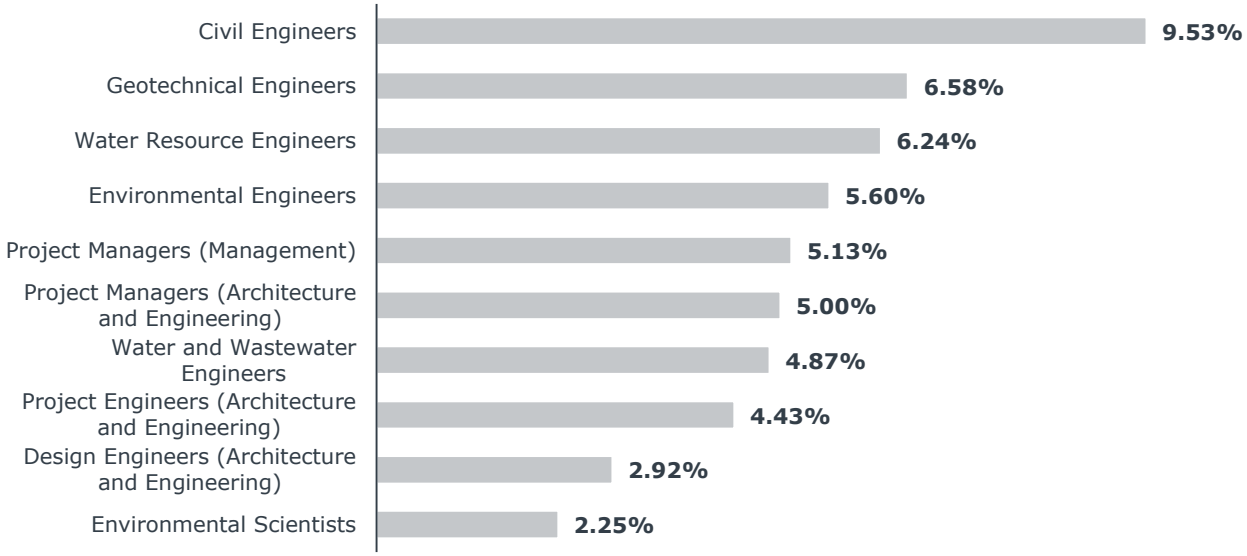
The dashed blue line represents the projected employment growth across all occupations from 2018 to 2028.

Source: EAB analysis. Emsi Analyst.

Top Titles in Job Postings for Bachelor's-Level Environmental Engineering Professionals

February 2019 – January 2020, Statewide Data

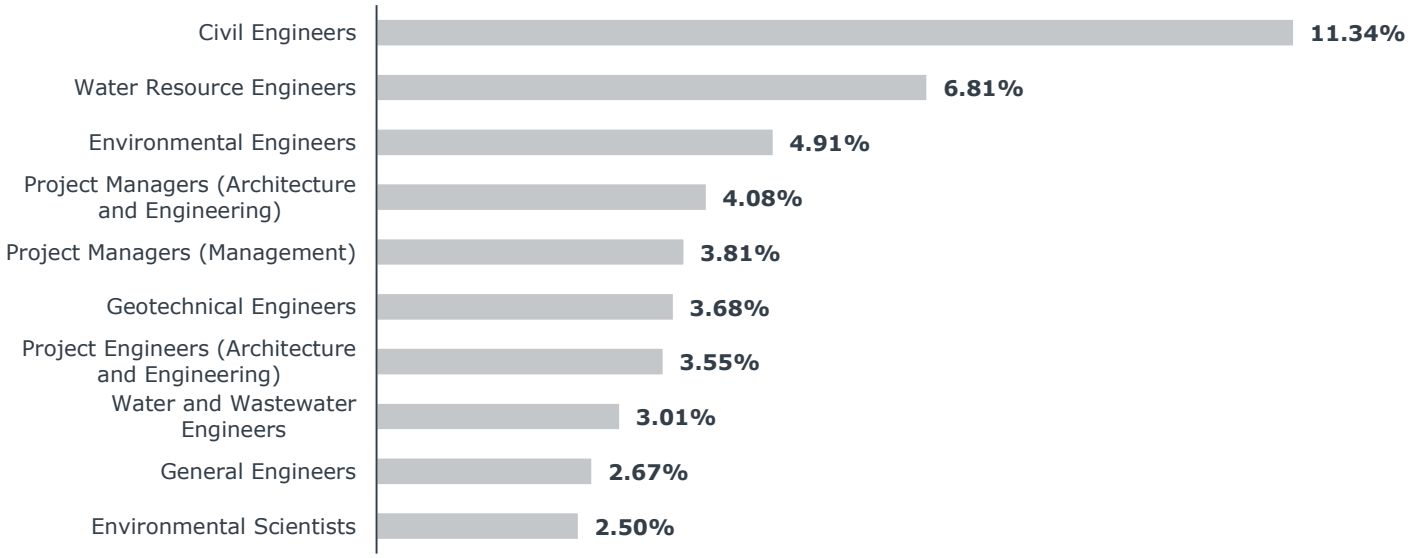
n = 2,980 job postings



Top Titles in Job Postings for Bachelor's-Level Environmental Engineering Professionals

February 2019 – January 2020, Regional Data

n = 14,476 job postings

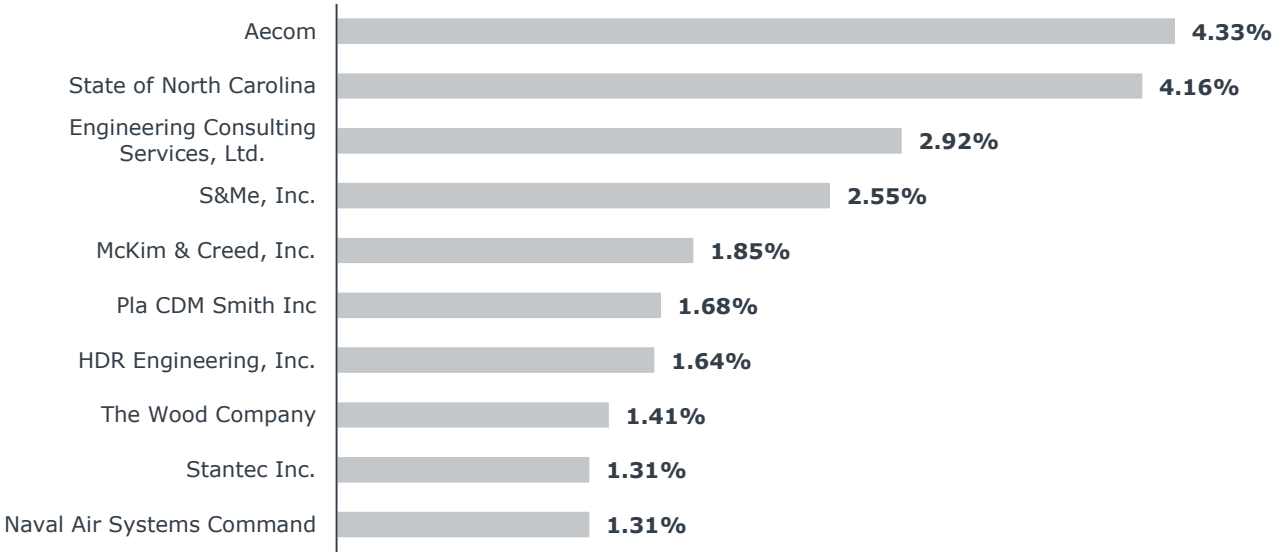


Source: EAB analysis. Emsi Analyst.

Top Employers Seeking Bachelor's-Level Environmental Engineering Applicants

February 2019 – January 2020, Statewide Data

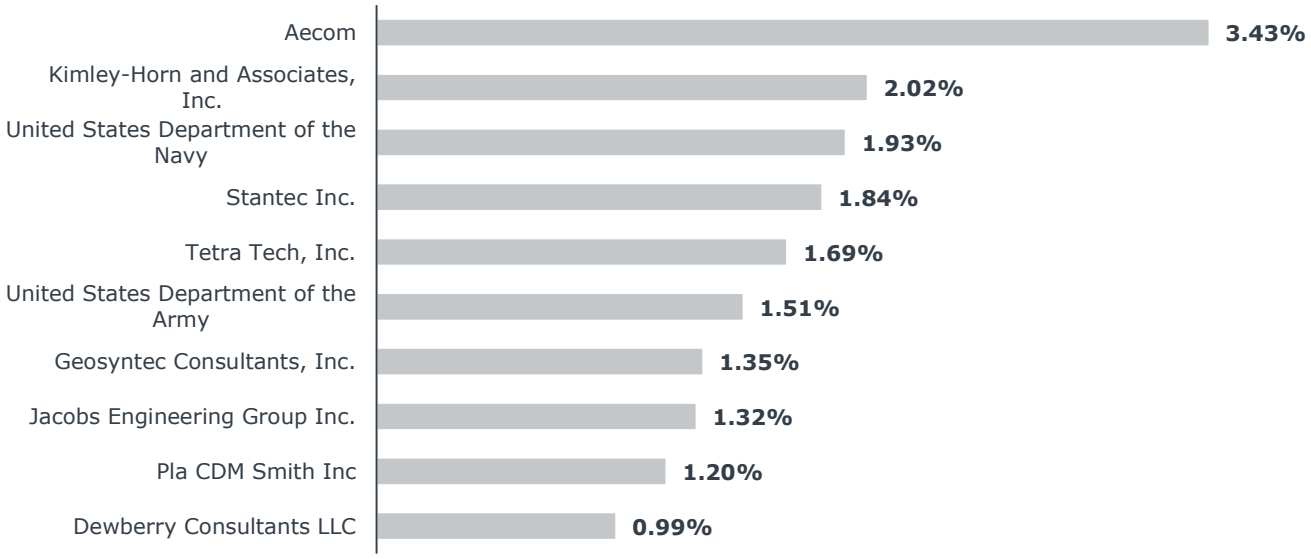
n = 2,980 job postings



Top Employers Seeking Bachelor's-Level Environmental Engineering Applicants

February 2019 – January 2020, Regional Data

n = 14,476 job postings

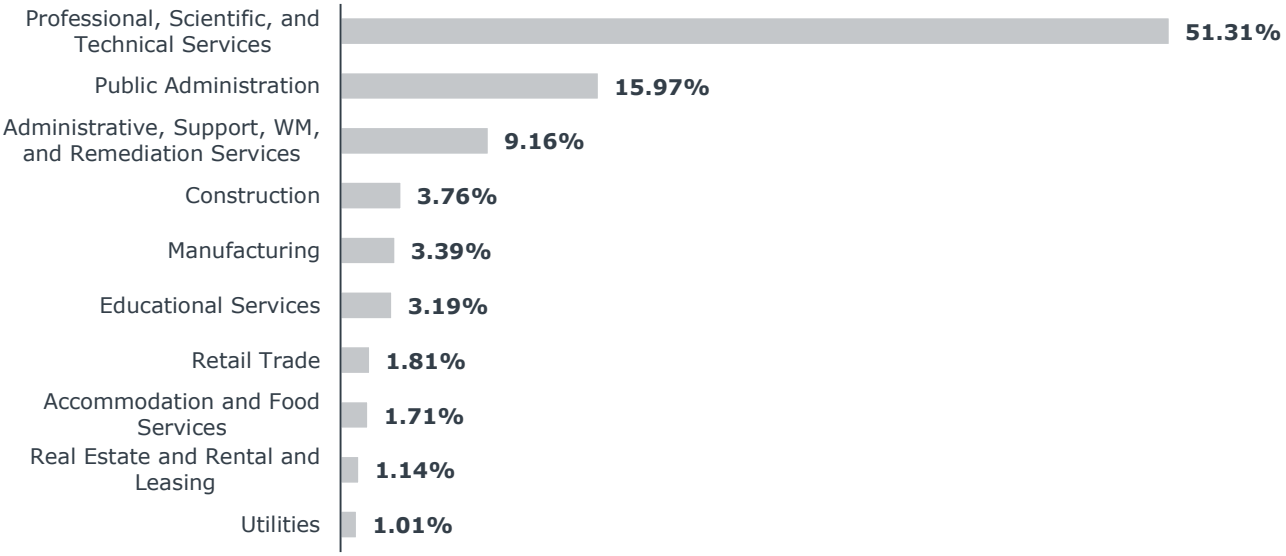


Source: EAB analysis. Emsi Analyst.

Top Industries Advertising Bachelor's-Level Environmental Engineering Job Postings

February 2019 – January 2020, Statewide Data

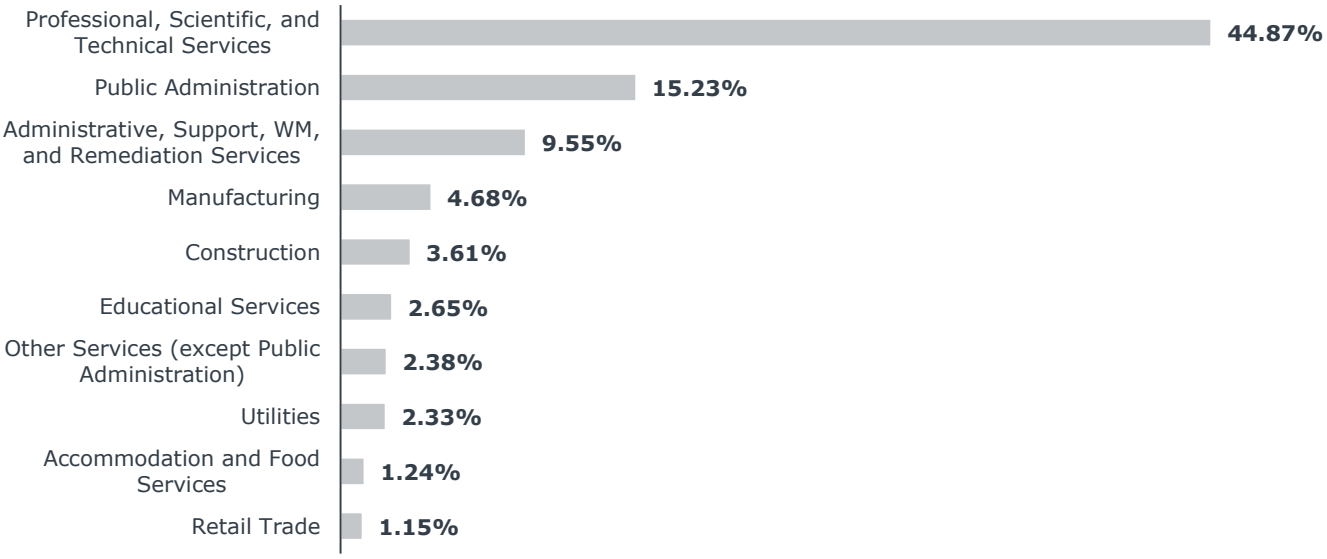
n = 2,980 job postings



Top Industries Advertising Bachelor's-Level Environmental Engineering Job Postings

February 2019 – January 2020, Regional Data

n = 14,476 job postings



Label abbreviations:

- "Administrative, Support, WM, and Remediation Services" – Administrative and Support and Waste Management and Remediation Services

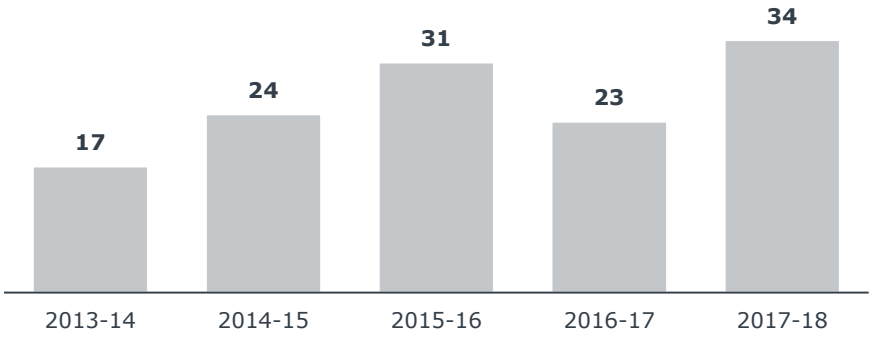
Source: EAB analysis. Emsi Analyst.

Statewide Analysis of CIP Code 14.1401 (Environmental/Environmental Health Engineering) Bachelor's-Level Completions

Reported statewide bachelor's-level environmental engineering program completions increased 23 percent per year on average between the 2013-2014 academic year and 2017-2018 academic years. The number of institutions reporting bachelor's-level environmental engineering completions increased eight percent on average in the same period, suggesting growth in student demand is outpacing growth in competition statewide. The median number of completions per institution also increased between 2013-2014 and 2017-2018, indicating the market is not dominated by a few large institutions and new entrants to the market may be able to capture enrollments.

Completions Reported over Time

2013-2014 to 2017-2018 Academic Years, Statewide Data



+23%

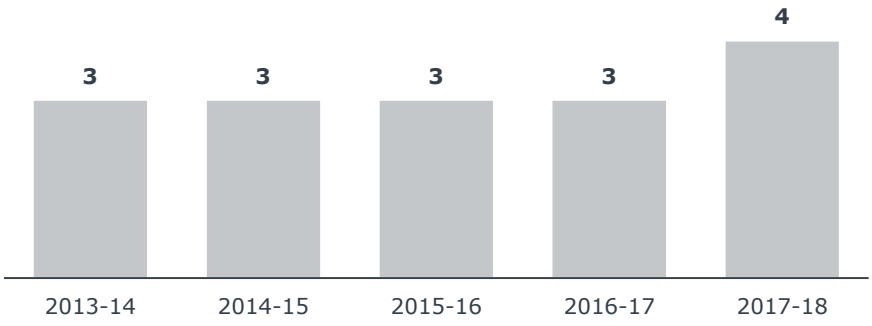
Average Annual Completions Growth

2013-2014 to 2017-2018 Academic Years, Statewide Data

- Average annual eight percent growth in number of institutions in the same period

Institutions Reporting Completions over Time

2013-2014 to 2017-2018 Academic Years, Statewide Data



0%

Institutions Reporting Completions with a 100% Distance-Delivery Option

2017-2018 Academic Year, Statewide Data

8.5

Mean Completions per Institution Reporting

2017-2018 Academic Year, Statewide Data

- An increase from the 5.7 mean completions reported in the 2013-2014 academic year.

3.5

Median Completions per Institution Reporting

2017-2018 Academic Year, Statewide Data

- An increase from the zero median completions reported in the 2013-2014 academic year.

Source: EAB analysis. National Center for Education Statistics.

Statewide Analysis of CIP Code 14.1401 (Environmental/Environmental Health Engineering) Bachelor's-Level Completions

Completions at half of the institutions that report environmental engineering completions increased, while completions at the remaining half remained the same. With new entrants to the market, market share has begun to become more evenly distributed, with the institutional leader, North Carolina State University at Raleigh, losing over 20 percentage points of the market share since the 2013-2014 academic year.

Institutions with Most Reported Completions

2013-2014 and 2017-2018 Academic Years, Statewide Data

Institution	Reported Completions, 2013-2014 Academic Year	Market Share, 2013-2014 Academic Year	Reported Completions, 2017-2018 Academic Year	Market Share, 2017-2018 Academic Year
North Carolina State University at Raleigh	17	100.00%	27	79.41%
Duke University	Not Offered	Not Offered	7	20.59%
Elon University	0	0.00%	0	0.00%
Old Dominion University	0	0.00%	0	0.00%

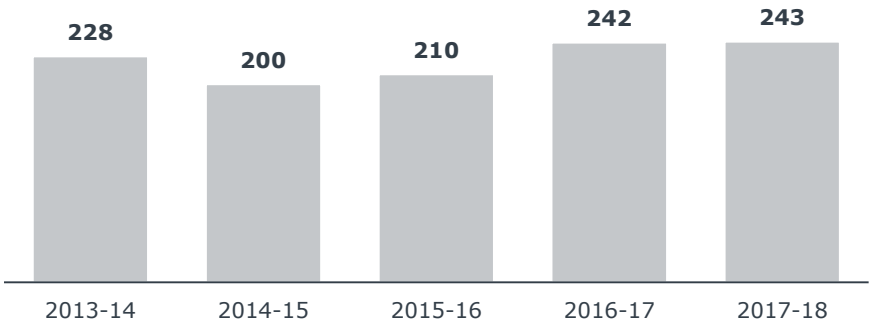
Source: EAB analysis. National Center for Education Statistics.

Regional Analysis of CIP Code 14.1401 (Environmental/Environmental Health Engineering) Bachelor's-Level Completions

Reported regional bachelor's-level environmental engineering program completions increased two percent per year on average between the 2013-2014 and 2017-2018 academic years. The number of regional institutions reporting bachelor's-level environmental engineering completions increased five percent on average in the same period, indicating new programs may face a challenging competitive landscape regionally. The increase in the median number of completions per institution between 2013-2014 and 2017-2018, however, suggests the market is not dominated by a few large institutions and new entrants to the market may be able to capture enrollments.

Completions Reported over Time

2013-2014 to 2017-2018 Academic Years, Regional Data



+2%

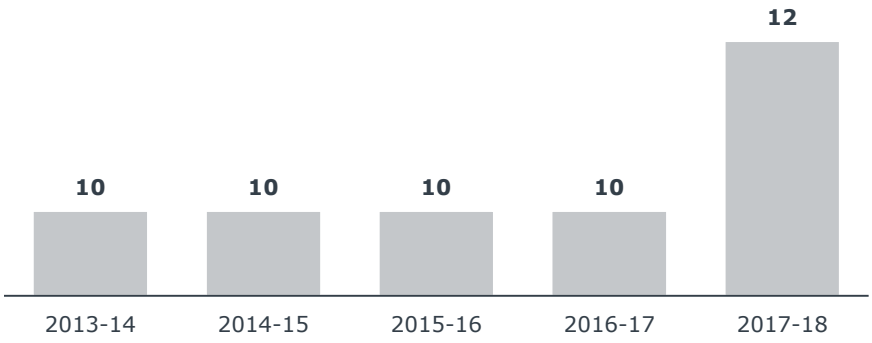
Average Annual Completions Growth

2013-2014 to 2017-2018 Academic Years, Regional Data

- Average annual five percent growth in number of institutions in the same period

Institutions Reporting Completions over Time

2013-2014 to 2017-2018 Academic Years, Regional Data



0%

Institutions Reporting Completions with a 100% Distance-Delivery Option

2017-2018 Academic Year, Regional Data

20.3

Mean Completions per Institution Reporting

2017-2018 Academic Year, Regional Data

- A decrease from the 22.8 mean completions reported in the 2013-2014 academic year.

21.0

Median Completions per Institution Reporting

2017-2018 Academic Year, Regional Data

- An increase from the 18.5 median completions reported in 2013-2014 academic year.

Source: EAB analysis. National Center for Education Statistics.

Regional Analysis of CIP Code 14.1401 (Environmental/Environmental Health Engineering) Bachelor's-Level Completions

Reported relevant completions grew across all the top ten institutions regionally, except for Georgia Institute of Technology – Main Campus, Clemson University, and Johns Hopkins University, which saw decreases in reported completions between the 2013-2014 and 2017-2018 academic years. The University of Central Florida and the University of Florida, the regional market leaders, saw slight declines in market share since the 2013-2014 academic year. Remaining institutions in the top ten hold between 2.47 and 16.05 percent of the market share.

Institutions with Most Reported Completions

2013-2014 and 2017-2018 Academic Years, Regional Data

Institution	Reported Completions, 2013-2014 Academic Year	Market Share, 2013-2014 Academic Year	Reported Completions, 2017-2018 Academic Year	Market Share, 2017-2018 Academic Year
University of Central Florida	41	17.98%	43	17.70%
University of Florida	41	17.98%	42	17.28%
Georgia Institute of Technology-Main Campus	46	20.18%	39	16.05%
University of Georgia	20	8.77%	28	11.52%
Clemson University	28	12.28%	26	10.70%
Florida International University	16	7.02%	23	9.47%
Florida Gulf Coast University	17	7.46%	19	7.82%
Johns Hopkins University	13	5.70%	9	3.70%
University of Miami	6	2.63%	7	2.88%
Kennesaw State University	Not Offered	Not Offered	6	2.47%

Source: EAB analysis. National Center for Education Statistics.

Appendix: Research Parameters and Sources

Research Methodology

EAB's market insights research guides strategic programmatic decisions at partner institutions. The Market Insights Service combines qualitative and quantitative data to help administrators identify opportunities for new program development, assess job market trends, and align curriculum with employer and student demand.

Unless stated otherwise, this report includes data from online job postings from February 1, 2019 to January 31, 2020. To best estimate employer demand for bachelor's-level environmental engineering professionals, the Forum analyzed job postings for bachelor's-level professionals based on relevant skills (e.g., "environmental engineering").

Definitions

"CIP" code refers to the Classification of Instructional Programming code.

"Region" and "regional" refer to the following states:

- Maryland,
- Virginia,
- South Carolina,
- Georgia, and
- Florida.

Research Questions

The requesting partner asked:

- **In which industries should the proposed program prepare students to work?**
- **Which employers demonstrate the greatest demand for potential graduates?**
- **In what positions do employers demonstrate the greatest need for graduates?**
- How are similar programs structured (e.g., credential awarded, cost)?
- How are similar programs delivered (e.g., modality, schedule)?
- What experiential or practical learning do similar programs offer (e.g., clinical components, capstone requirements)?
- What accreditation do similar programs advertise?

Bolded questions were addressed within this analysis; remaining questions would be addressed if partner pursues continued research.

Appendix: Research Parameters and Sources

Project Sources

The Forum consulted the following sources for this report:

- EAB's internal and online research libraries
- Emsi Analyst, described below
- U.S. Bureau of Labor Statistics
- U.S. National Center for Education Statistics (NCES)

Labor Market Intelligence Partner: Emsi

This report includes data made available through EAB's partnership with Emsi (formerly Economic Modeling Specialists International), a labor market analytics firm serving higher education, economic development, and industry leaders in the U.S., Canada and the United Kingdom.

Emsi curates and maintains the most comprehensive labor market data sets available for academic program planning, providing real-time job posting data, workforce and alumni outcomes data, and traditional government sources of data. Under this partnership, EAB may use Emsi's proprietary Analyst™ and Alumni Insight™ tools to answer partner questions about employer demand, the competitive landscape, in-demand skills, postings versus actual hires, and skills gaps between job postings and professionals in the workforce. The Emsi tools also provide EAB with in-depth access to unsuppressed, zip-code-level government data for occupations, industries, programs, and demographics. For more complete descriptions of the Emsi tools, visit:

- http://www.economicmodeling.com/analyst/
- https://www.economicmodeling.com/alumni-insight/

To learn more about Emsi and its software and services, please contact Bob Hieronymus, Vice President of Business Development at bob.hieronymus@economicmodeling.com or (208) 883-3500.

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Appendix B: The number of male and female graduates from programs that have both Civil Engineering and Environmental Engineering programs in the east and southeast region [1].

Year	Degree	Gender	Clemson University	Duke University	Florida International	Georgia Tech	Kennesaw State	NCSU	The Johns Hopkins	University of Alabama	University of Florida	University of Georgia	University of Miami
2018	Civil Engineering	Male	88	7	81	78	55	98	12	82	102	33	13
		Female	22	4	35	47	18	28	3	41	36	11	4
		Total	**110**	**11**	**116**	**125**	**73**	**126**	**15**	**123**	**138**	**44**	**17**
	Environmental Engineering	Male	17	3	13	15	4	15	2	10	12	18	3
		Female	9	3	10	24	2	12	7	3	30	10	4
		Total	**26**	**6**	**23**	**39**	**6**	**27**	**9**	**13**	**42**	**28**	**7**
2017	Civil Engineering	Male	100	7	77	115	47	103	8	87	98	24	10
		Female	18	9	30	83	13	23	5	39	19	12	5
		Total	**118**	**16**	**107**	**198**	**60**	**126**	**13**	**126**	**117**	**36**	**15**
	Environmental Engineering	Male	18	1	9	24	0	10	2	2	20	18	6
		Female	18	3	5	30	0	13	10	3	24	12	7
		Total	**36**	**4**	**14**	**54**	**0**	**23**	**12**	**5**	**44**	**30**	**13**
2016	Civil Engineering	Male	86	6	55	95	47	108	13	94	74	11	5
		Female	27	6	22	35	10	32	4	31	20	6	1
		Total	**113**	**12**	**77**	**130**	**57**	**140**	**17**	**125**	**94**	**17**	**6**
	Environmental Engineering	Male	40	1	6	17	0	15	7	5	19	10	0
		Female	20	1	4	22	0	11	10	0	20	7	4
		Total	**60**	**2**	**10**	**39**	**0**	**26**	**17**	**5**	**39**	**17**	**4**

[1] "Engineering College Profiles and Statistics Book", published by the American Society for Engineering Education

Attachment D

Correspondence from Randy Kabrick with Brown & Caldwell, Raleigh, North Carolina

Brown AND Caldwell

5430 Wade Park Blvd
Raleigh, NC 27607

April 3, 2020

Dr. John L. Daniels, P.E.
Professor and Chair
Department of Civil and Environmental Engineering
The University of North Carolina at Charlotte
Charlotte, NC 28223

RE: My Support for a B.S in Environmental Engineering at UNC Charlotte

Dear Dr. Daniels,

Thanks for letting me know that the Department of Civil and Environmental Engineering is seeking authorization to plan and eventually establish a B.S. in environmental engineering. Given the name of your department, its somewhat surprising that this program isn't yet in place.

In my capacity as Vice President at Brown & Caldwell and more than 40 years in the business of environmental engineering, I have had the opportunity to see the environmental engineering field grow and evolve. We need well-trained graduates to serve our clients in the most effective way possible.

It is clear to me that there is demand for graduates of a B.S. environmental engineering program at UNC Charlotte. The addition of this program is long overdue. As a UNCC alumnus (1974), I welcome this addition.

Best regards,

Randy Kabrick, P.E., BCEE, RSM
Vice President

Attachment E

Email Correspondence from Jessica Bednarcik with Duke Energy, Charlotte, North Carolina

From: **Bednarcik, Jessica L** <Jessica.Bednarcik@duke-energy.com>
Date: Wed, Feb 16, 2022 at 5:30 PM
Subject: RE: [EXTERNAL] New Bachelor of Science in Environmental Engineering program at UNC Charlotte
To: Christina Saunders <cpalme21@uncc.edu>

Christina,

Duke Energy is committed to responsible stewardship of the environment. We have a large team that works with our fleet to maintain compliance with all environmental permits and requirements, works with project managers so there is the right focus on land, water, and habitat conservation during execution of construction projects, and works with our operational fleet to lower air emissions throughout our service territories. We have a responsibility to produce and deliver energy that is reliable, affordable, and clean. Research and education on key environmental engineering concepts from institutions like UNC Charlotte will ensure that tomorrow's workers will help us to continue to meet our commitments to the communities where we work and live.

Students who graduate from a program like the one being proposed at UNC Charlotte will be able to enter the workplace with transferrable skills that can be put to use right away as we continue to execute our environmental commitment to customers. As we shift to new generation resources that will enable us to meet our commitment of net-zero carbon emissions by 2050, environmental engineers will be key teammates to ensure that what powers our communities continues to be protective of the public and environment for future generations.

Jessica

Attachment F

Correspondence from Jacqueline A. Jarrell with Charlotte Water, Charlotte, North Carolina

April 14, 2022

Dr. John L. Daniels, P.E.
Professor and Chair
Department of Civil and Environmental Engineering
The University of North Carolina at Charlotte
Charlotte, NC 28223

RE: Bachelor of Science (B.S.) in Environmental Engineering at UNC Charlotte

Dear Dr. Daniels,
I am thrilled to hear that the Department of Civil and Environmental Engineering is seeking authorization to establish a B.S. in Environmental Engineering. With the changes that are happening in our world, there is such a great need for more focus on environmental concerns and how we can protect the environment and hopefully continue to do things to improve it. The need for environmental engineers is critical to finding those solutions and I believe that need will continue to grow with changes we are seeing with climate and natural resources.

I have been with Charlotte Water for over 30 years which has provided me the opportunity to understand the local and regional environment and the role water plays. As a past President of the Water Environment Federation (WEF), a 45000 international water professional member organization, I have also been exposed to global challenges. I have learned about the impacts and the interrelationships of managing resources, protection of the environment, and public health.

I believe that environmental engineering will continue to move towards center stage as an engineering discipline due to the need to develop innovative approaches that respond to environmental challenges in the future and the promotion of a circular economy.

As an alumni and resident of Charlotte, I am very proud of the many accomplishments and the progressiveness of UNC Charlotte. An Environmental Engineering discipline is the perfect complement to the current disciplines at UNC Charlotte and I am excited to support UNC Charlotte's efforts.

Sincerely,

Jacqueline A. Jarrell

Jacqueline A. Jarrell, P.E., WEF Fellow
Deputy Director

Attachment G
Academic Plan of Study (APS) for BS in Environmental Engineering
120 hours required to complete degree
Courses in BOLD require a grade of "C" or better

Course	Pre/Corequisites	Cr. Hrs	Course	Pre/Corequisites	Cr. Hrs
MATH 1241: Calculus I	MATH 1103 or math placement	3	**MATH 1242: Calculus II**	MATH 1241	3
BIOL 1110 Principles of Biology		3	**PHYS 2101: Physics I**	MATH 1241	3
ENGR 1201: Intro to Eng I	Co-req: MATH 1241	2	**PHYS 2101L: Physics I Lab**	Pre/Coreq: PHYS 2101	1
LBST 110X series		3	**UWRT 1103: English**		3
Social Sci. Gen. Ed.		3	**ENGR 1202: Intro to Eng II**	ENGR 1201 with "C" or better	2
		14	LBST Series*		3
					15

Course	Pre/Corequisites	Cr. Hrs	Course	Pre/Corequisites	Cr. Hrs
MATH 2241: Calculus III	MATH 1242	3	**MATH 2171: Diff. Eq.**	MATH 1242	3
MEGR 2141: Eng Mechanics I (Statics)	PHYS 2101 & MATH 1242 with "C" or better	3	**CHEM 1252 Chemistry II**	PHYS 2101 or CHEM 1251	3
CHEM 1251: Chemistry I	MATH 1100 or above	3	**CHEM 1252 Chemistry II Lab**	Pre/Coreq PHYS 2102 or Pre/Coreq CHEM 1252	1
CHEM 1251L: Chemistry I Lab	Pre/Coreq: CHEM 1251	1	**CEGR 2103 Surveying and Technical Drawing**	ENGR 1202 with a grade of C or above	3
CEGR 2102: Eng. Econ.	ENGR 1201 with a grade of C or above	3	**CEGR 2154: Design Project Lab**	CEGR 2102 with a grade of C or above	2
LBST 2301		3	**MEGR 2144: Solid Mechanics**	MEGR 2141 with a C or better	3
		16			15

Course	Pre/Corequisites	Cr. Hrs	Course	Pre/Corequisites	Cr. Hrs
CEGR 3143: Hydraulics & Hydrology	MATH 2171 and MEGR 2141 with grades of C or above	3	**CEGR 3141: Environmental Eng**	MATH 2171, CHEM 1251, CHEM 1251L, & MEGR 2141 with grades of C or above	3
BIOL 2259: Fundamentals of Microbiology	BIOL 1110 and CHEM 1251 with grade of C or above.	3	CEGR 3155: Environmental Lab	Pre/Coreq: CEGR 3141	2
CEGR 3278: Geotechnical Eng.	MATH 2171 and MEGR 2144 with grades of C or above	3	**MEGR 3111 - Thermodynamics**	MATH 2171 & PHYS 2101 with grades of C or above	3
CEGR 3258: Geotechnical Lab	Pre/Coreq: CEGR 3278	2	**CEGR 4264: Landfill Design**	CEGR 3258, CEGR3278 with grade of C or better	3
ESCI 1101-Earth Sciences-Geography		3	**CEGR 4146: Advanced Engineering Hydraulics**	CEGR 3143 with a C or above	3
		14	**ENVE 3111 Construction Engineering**	CEGR 3278 with a C or above	2
					16

Course	Pre/Corequisites	Cr. Hrs	Course	Pre/Corequisites	Cr. Hrs
STAT 3128: Prob &Stat	MATH 2241	3	ENVE 3201: Senior Design	Instructor's approval	2
CEGR 4142: Water Treatment Engineering	CEGR 3141 with a C or above	3	**CEGR 4242: Wastewater Treatment Design**	CEGR 3141 with a C or above	3
CEGR 4247: Sustainability	CEGR 3141 with a grade of C or above	3	**CEGR 4144: Engineering Hydrology**	CEGR 3143 with a C or above	3
CEGR 4145: Groundwater Resources Engineering	CEGR 3143 with a C or above	3	ENGR 3295: Prof Dev		1
CEGR 4246: Energy and the Environment	CEGR 3141 with a C or above	3	Technical Elective		3
		15	LBST Series*		3
					15