



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 is 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

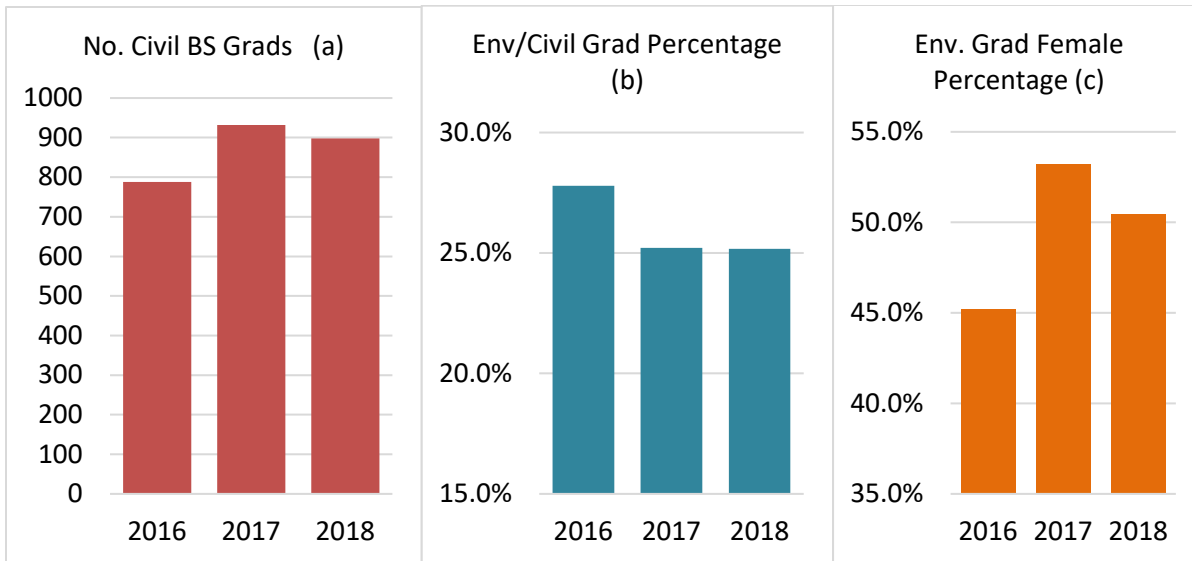


Figure 1. 2016 – 2018 number of BS Civil Engineering graduates (panel A), number of BS Environmental Engineering graduates as a percentage of the Civil Engineering graduate number (panel B), and the percentage of BS Environmental Engineering graduates that are female (panel C) for eleven schools in the 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](http://BurningGlass.com)).
 - 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 as 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	<i>John L. Dahn</i>	2/9/22
Provost	<i>Jean F. Larden</i>	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



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%

543 job postings

2,980 job postings

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

Average Monthly Demand

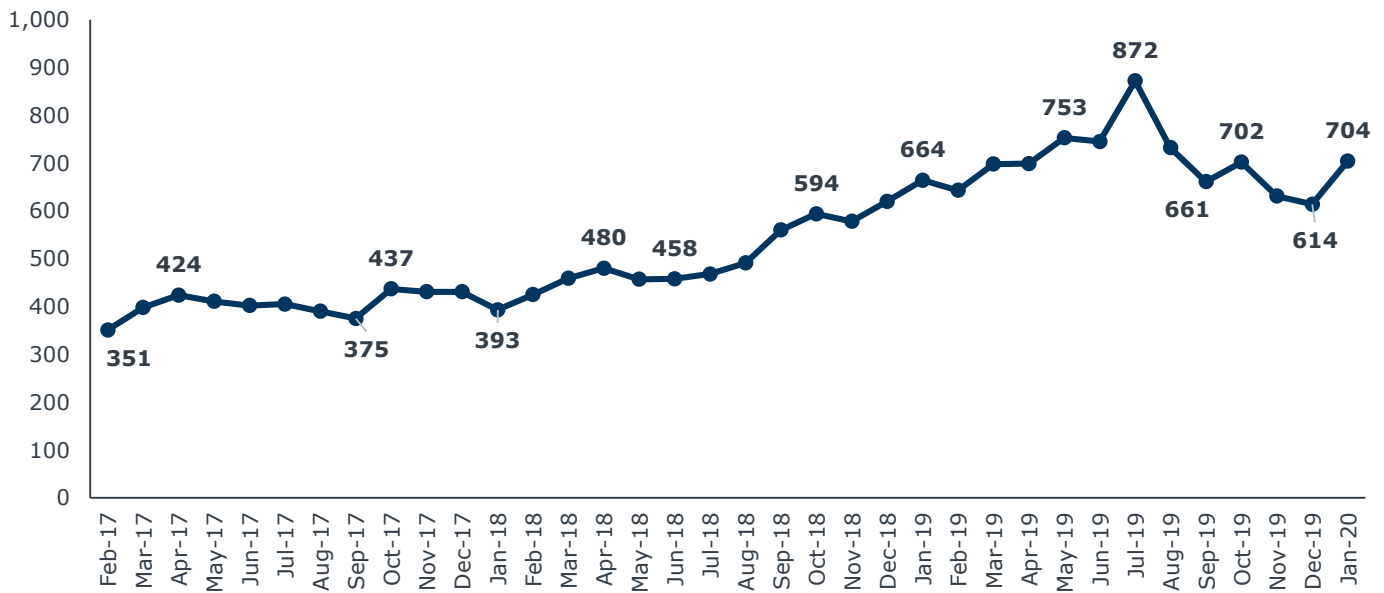
February 2017 – January 2020, Statewide Data

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

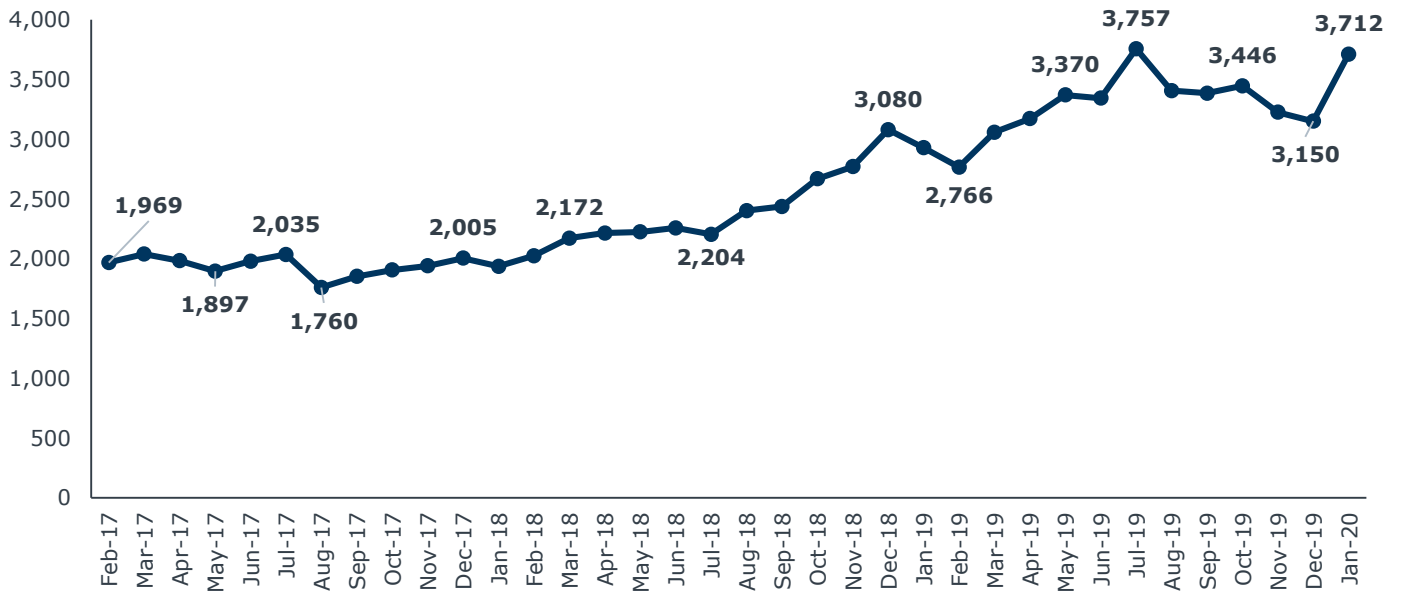
14,476 job postings

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



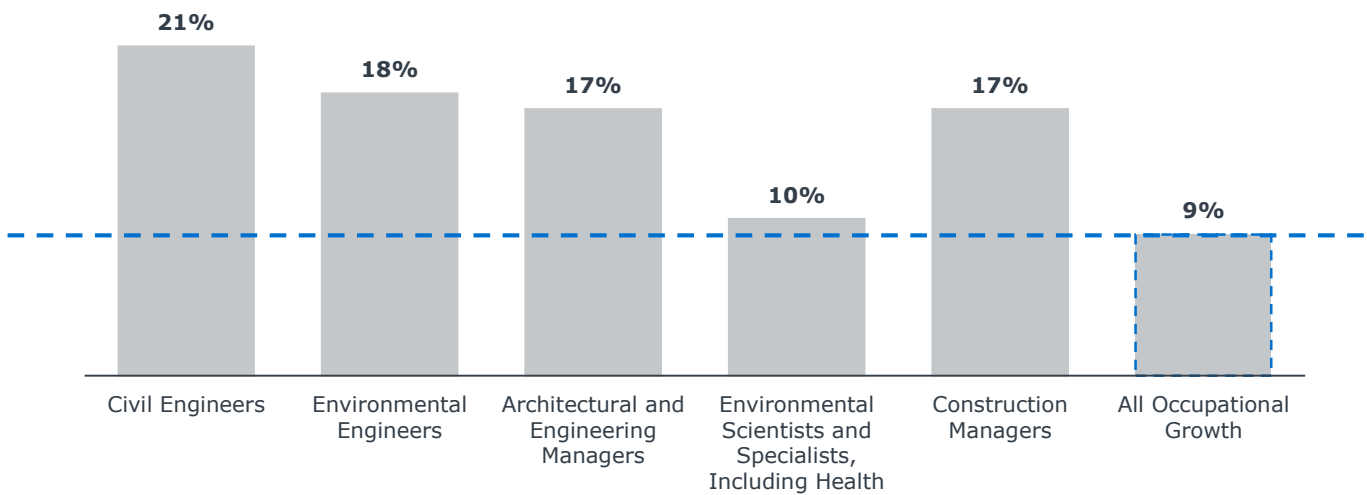
Source: EAB analysis. Emsi Analyst.

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

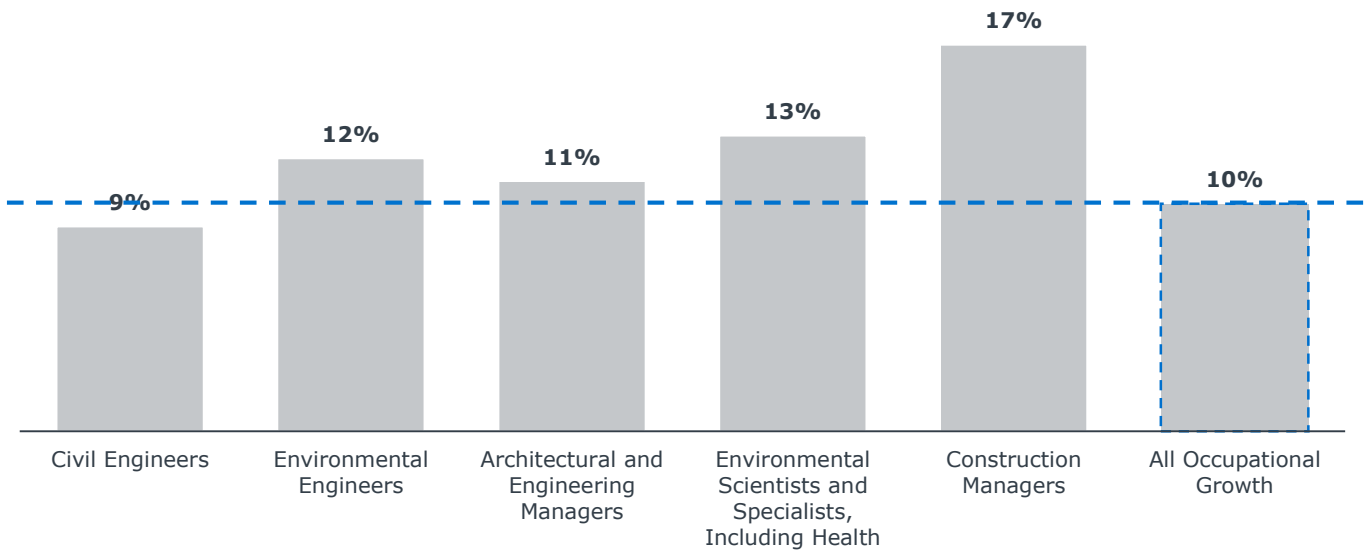
Statewide, employment for the top five most frequently posted relevant occupations is projected to increase faster than the average for all statewide occupations. Notably, employment of “civil engineers” is projected to grow at a rate 12 percentage points above the statewide average. Regionally, employment 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 Occupations¹

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”).

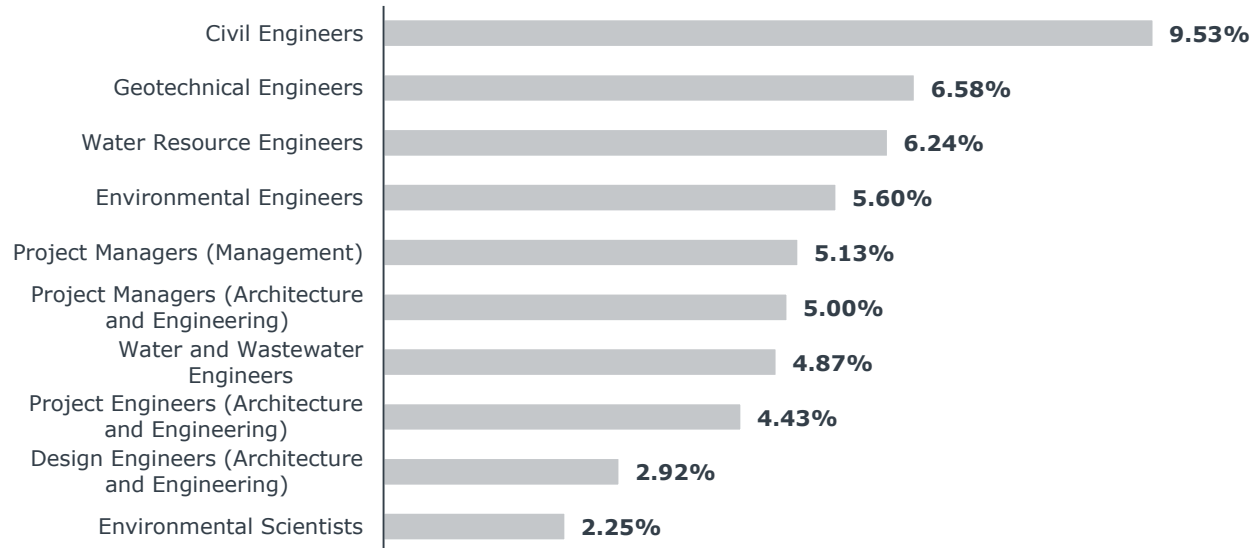
— — — The dashed blue line represents the projected employment growth across all occupations from 2018 to 2028.

Source: EAB analysis. Emsi Analyst.

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

February 2019 – January 2020, Statewide Data

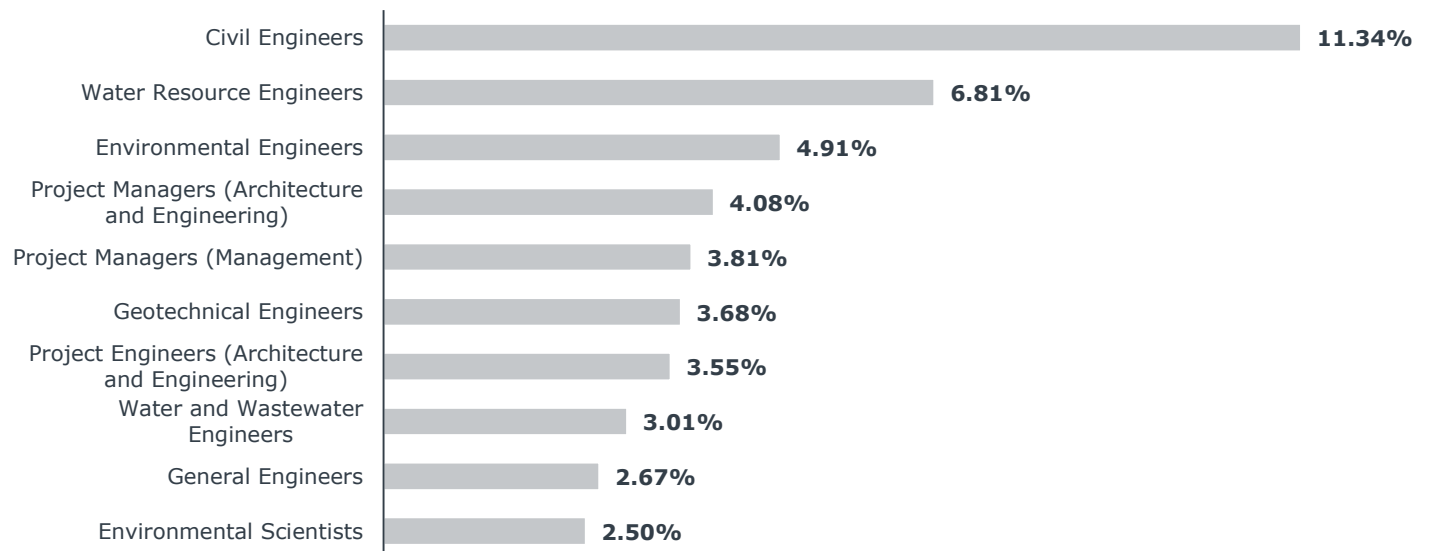
n = 2,980 job postings



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

February 2019 – January 2020, Regional Data

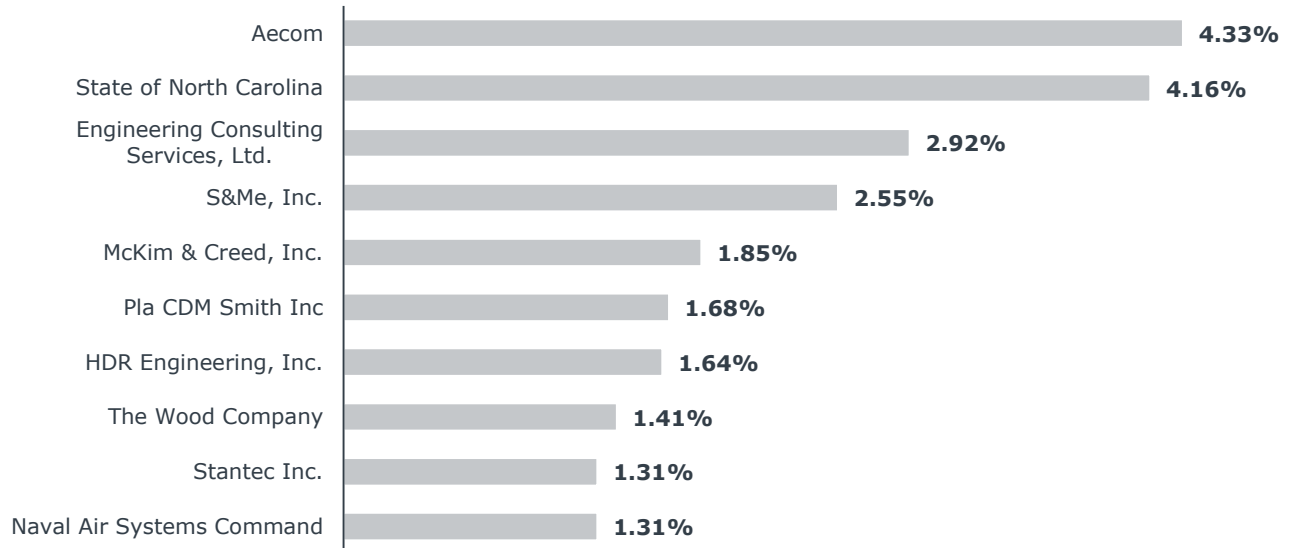
n = 14,476 job postings



Top Employers Seeking Bachelor’s-Level Environmental Engineering Applicants

February 2019 – January 2020, Statewide Data

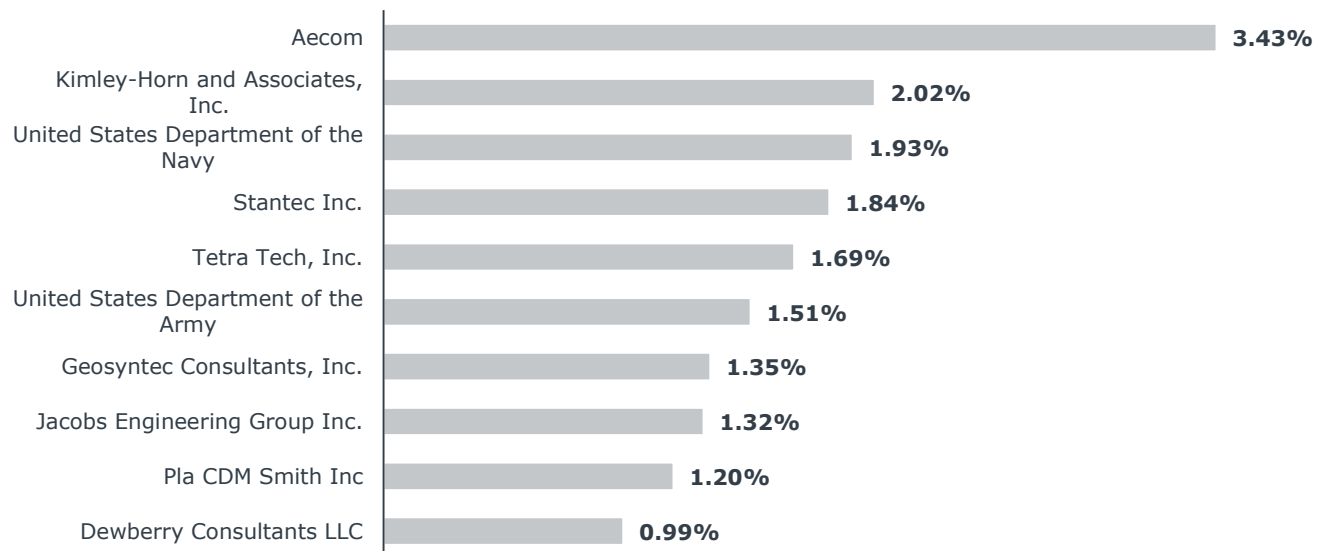
n = 2,980 job postings



Top Employers Seeking Bachelor’s-Level Environmental Engineering Applicants

February 2019 – January 2020, Regional Data

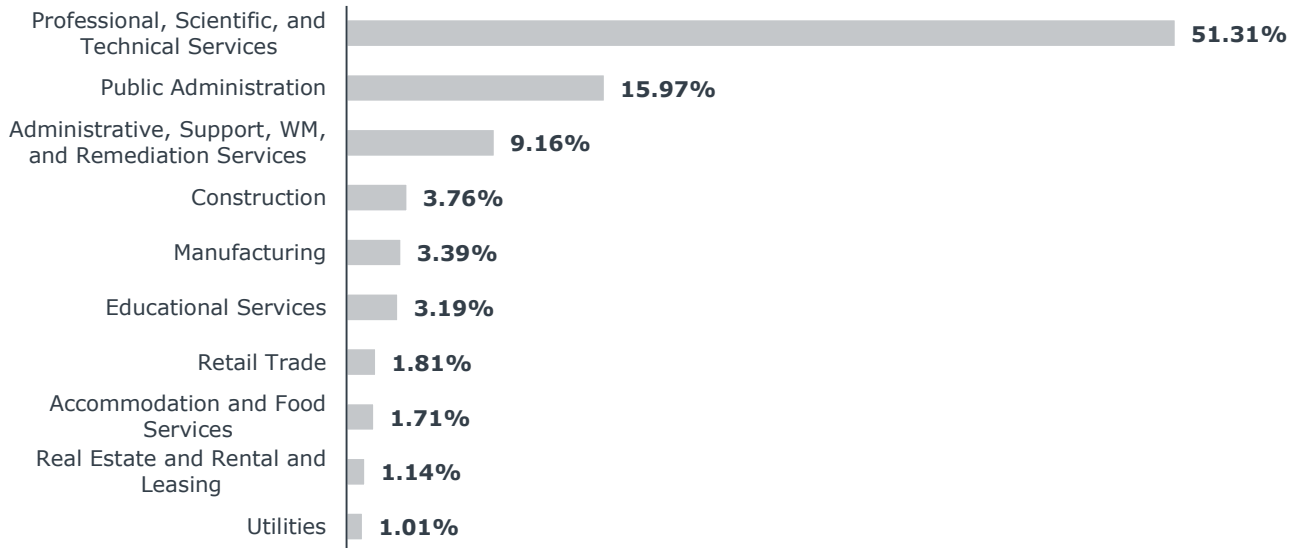
n = 14,476 job postings



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

February 2019 – January 2020, Statewide Data

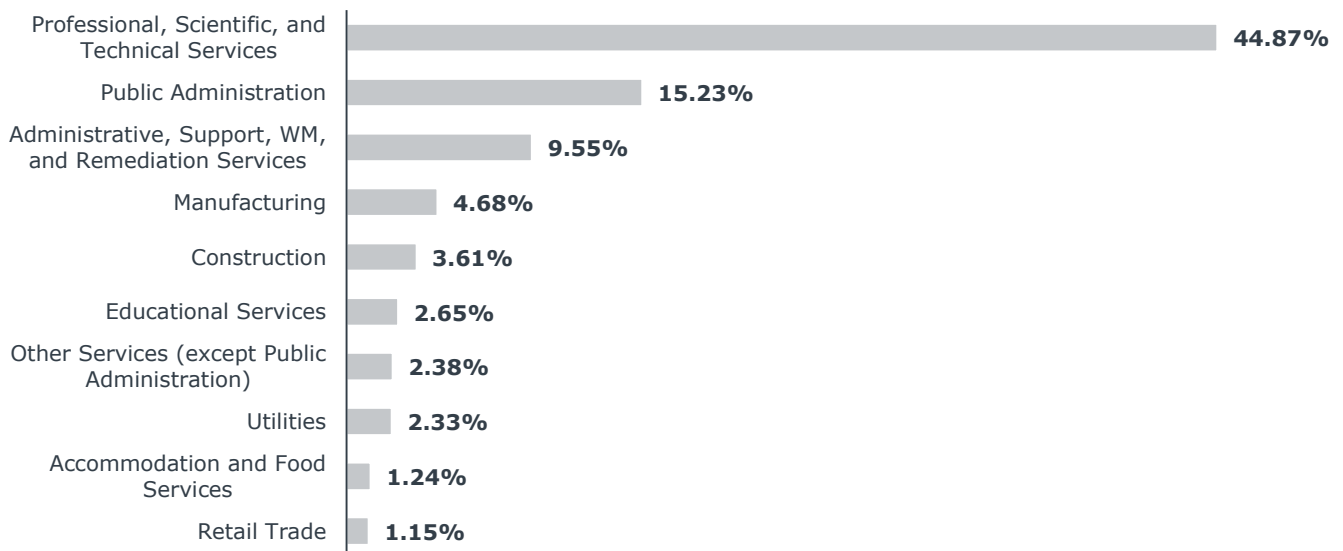
n = 2,980 job postings



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

February 2019 – January 2020, Regional Data

n = 14,476 job postings



Label abbreviations:

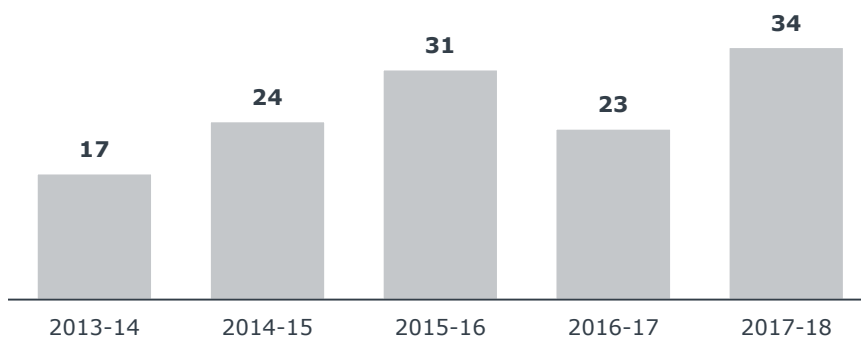
- “Administrative, Support, WM, and Remediation Services” – Administrative and Support and Waste Management and Remediation Services

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%

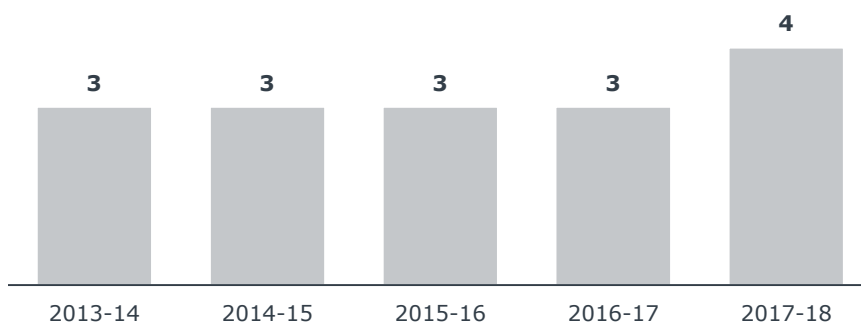
Average Annual Completions Growth

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.

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

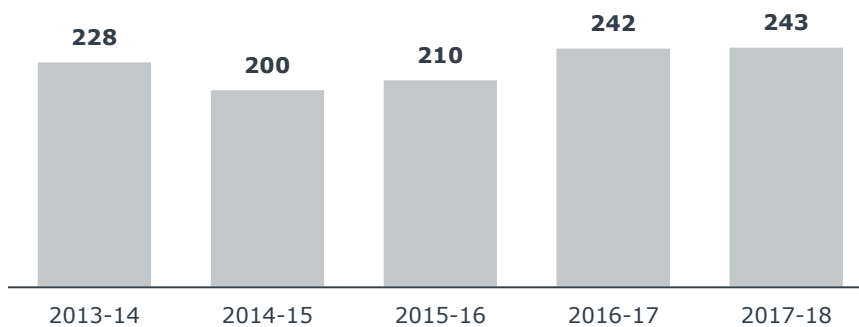
Institution	Reported Completions, 2013-2014 Academic Year	Market Share, 2013-2014 Academic Year	Reported Completions, 2017-2018 Academic Year	Market Share, 2017-2018 Academic Year
North Carolina State University at Raleigh	17	100.00%	27	79.41%
Duke University	Not Offered	Not Offered	7	20.59%
Elon University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

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%

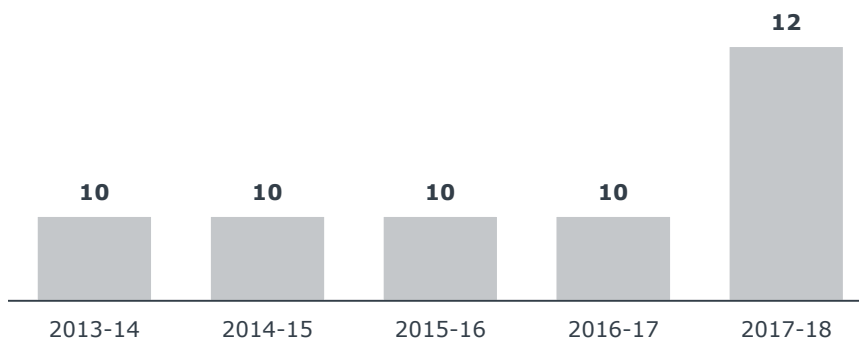
Average Annual Completions Growth

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.

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%

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