

BOARD OF HIGHER EDUCATION

REQUEST FOR COMMITTEE AND BOARD ACTION

COMMITTEE: Academic Affairs

NO: AAC 17-22

COMMITTEE DATE: June 13, 2017

BOARD DATE: June 20, 2017

**APPLICATION OF THE UNIVERSITY OF MASSACHUSETTS LOWELL TO AWARD
THE BACHELOR OF SCIENCE IN ENVIRONMENTAL ENGINEERING**

MOVED: The Board of Higher Education hereby approves the application of the **University of Massachusetts Lowell** to award the **Bachelor of Science in Environmental Engineering**.

Upon graduating the first class for this program, the University shall submit to the Board a status report addressing its success in reaching program goals as stated in the application and in the areas of enrollment, curriculum, faculty resources, and program effectiveness.

Authority: Massachusetts General Laws Chapter 15A, Section 9(b)

Contact: Winifred M. Hagan, Ed.D., Associate Commissioner for Academic Affairs and Student Success

BOARD OF HIGHER EDUCATION
June 13, 2017
Bachelor of Science in Engineering in Environmental Engineering

INTENT AND MISSION

The University of Massachusetts Lowell (UML) is a public research university committed to excellence in teaching, research and community engagement. The university is dedicated to transformational education that fosters student success, lifelong learning and global awareness. The Francis College of Engineering (COE) at UML serves as an economic engine for the Merrimack Valley, providing talent and technology in engineering, advanced materials, advanced manufacturing, and electronics. The proposed Bachelor of Science in Environmental Engineering program is strategically aligned with these missions, offering an affordable undergraduate degree designed to prepare students for professional careers in environmental engineering. UML confers the Bachelor of Science in Engineering (B.S.E.) degree with specializations, hence the B.S. in Engineering, in Environmental Engineering (B.S.E./ EE). This is equivalent to the B.S. in Environmental Engineering at other institutions.

The proposed B.S.E. / EE is also designed to prepare graduates to pursue M.S. and Ph.D. degrees in environmental engineering or other graduate engineering programs. The program is designed to satisfy the Accreditation Board for Engineering and Technology (ABET) requirements for accreditation. It is also intended to prepare students for the Fundamentals of Engineering exam, that is the first step on the path to professional licensure as a Professional Engineer. After a period of professional practice under the supervision of a professional engineer engineers take a second examination known as the Principles and Practice of Engineering exam to become professional engineers. These examinations are administered by the National Council of Examiners for Engineering and Surveying. UML intends that graduates of the proposed program will be prepared to succeed on these exams.

The proposed B.S.E. / EE is intended to prepare students for environmental engineering careers including areas of hazardous waste site remediation, environmental fate and transport of pollutants, emerging pollutants and micro pollutants, energy recovery from wastewater treatment facilities, and water and waste water treatment. As well the proposed program is intended to prepare graduates to address issues of environmental challenges related to climate change.

The proposed program obtained all necessary governance approvals on campus and was approved by the University of Massachusetts Board of Trustees on April 12, 2017. The required letter of intent was circulated on April 13, 2017. No comments were received.

NEED AND DEMAND

National and State Labor Market Outlook

In 2014 UML contracted Hanover Research (Washington, DC) to conduct a market analysis for a B.S.E. / EE. In doing so, Hanover Research examined the New England Regional Compound Annual Growth Rate (NE CAGR), which measures the average annual percentage change in environmental engineering bachelor's degrees completed for a 5 year period (2008-2012). The NE CAGR at 40.5%, was higher than the CAGR for all engineering fields combined at 5.1%. It was also higher than bachelor's degrees across all academic disciplines at 2.8%. UML reports that this regional statistic is reflective of the national trend.

The proposed B.S.E. / EE program is expected to help meet the demand for environmental engineering professionals in Massachusetts and in the US. According to the U.S. Bureau of Labor Statistics (BLS), in May 2015 Massachusetts was among states with the highest concentration of environmental engineers in the country. The BLS Occupational Outlook Handbook projects growth in environmental engineering jobs to be >12% for the period 2014-2024. The MA Executive Office of Labor and Workforce Development projected a similar rate of job growth for environmental engineers during the same period, due to retirements as well as the creation of new jobs. Regionally, Massachusetts accounts for about 60% of the average annual job openings in the field¹. UML estimates a regional approximate average of 171 environmental engineering jobs available annually.

Student Demand

Based on degree completion trends in related fields, Hanover Research indicated that student demand for a program can be estimated as trending upward and that environmental engineering is a small, but rapidly growing, subdiscipline of engineering. UML reports that recent open house events indicate consistent and numerous student inquiries regarding the availability of a B.S.E. / EE program on campus.

OVERVIEW OF PROPOSED PROGRAM

Program Overview

The proposed B.S.E. / EE has been in development at UML for the last two years beginning with the aforementioned market survey by Hanover Research that was completed in August 2014. A four member B.S.E. / EE undergraduate program committee consisting of the chair of Civil and Environmental Engineering (CEE) department and three CEE faculty members was developed a preliminary program proposal in the fall 2015. The proposal was accepted by the UML Undergraduate Policy Committee (UPC) in April 2016 and the UML Faculty Senate in May 2016. The University of Massachusetts President's Office directed UML to develop the final proposal on June 27, 2016.

¹ *Hanover Research Market Analysis, 2014*

Current COE administrative staff are expected to handle administrative duties consistent with other undergraduate programs. The proposed degree program will be administered by the Department of Civil and Environmental Engineering. A Senior Director will be assigned to oversee the proposed B.S.E. / EE program and report to the Chair of the Civil and Environmental Engineering Department. UML plans that the senior director will, with administrative assistance as needed, market the program, recruit students, and provide student advisement on administrative matters. All curriculum development, review, modifications, and assessments will follow existing committee structures and processes.

Duplication

UML reports that the findings of Hanover Research indicated the B.S.E. / EE is not offered in any state university in Massachusetts. Among the private institutions in Massachusetts, an ABET accredited B.S. in environmental engineering program is offered by MIT, Tufts, and WPI. There is a notable difference in affordability between private institutions and UML. Undergraduate tuition and fees in AY17 at WPI, MIT and Tufts were, respectively \$46,364, \$48,140 and \$51,304. In contrast, undergraduate tuition and fees at UML in AY17 were \$14,307 for in-state students and \$30,875 for out-of-state students.

ACADEMIC AND RELATED MATTERS

Admission

UML reports that all freshman applicants are evaluated using standards determined by both the Board of Higher Education and the University of Massachusetts. Freshman applying to the College of Engineering, which includes this new program, are subject to the same standards. Applications require submission of a high school GPA and an SAT score. A no test option that waives the SAT requirement is available. UML requires that Applicants to this program have completed four years of Math and Science, with a minimum of pre-calculus. Applicants with calculus and calculus-based physics have an advantage. In all cases, admission to the program is subject to review by undergraduate admissions.

Program Enrollment

	Year 1	Year 2	Year 3	Year 4
New Full-Time	25	30	35	40
Continuing Full-Time		25	55	90
New Part-Time				
Continuing Part-Time				
Totals	25	55	90	130

Curriculum (Attachment A)

The proposed Environmental Engineering curriculum consists of 121 credits. The proposed starting date is in the fall of 2018. Courses are expected to be offered in the fall, spring, and summer terms, allowing full-time students to complete the program in four calendar years. Elective courses are devised to capture a range of areas affiliated with the study of Environmental Engineering. Elective choices will also facilitate an M.S. in Civil and Environmental Engineering option.

Internships or Field Studies

The UML Professional Cooperative Education program provides undergraduate students with the chance to systematically integrate their classroom studies with professional work experiences. The Professional Co-op program is a partnership among students, the University and employers. It is administered by the UMass Lowell Career & Co-op Center. Currently the CEE Department has an assigned coordinator within the Co-op Center. It is anticipated that students enrolled in the proposed program would participate in the Co-op program.

In addition, it is planned that students in the proposed B.S.E. / EE program will leverage UML partnerships with many national and local engineering firms to secure Co-op placements, internships, and job placements. Numerous national and international environmental engineering firms maintain offices in Massachusetts (CDM Smith, Weston & Sampson, Woodard & Curran, Tighe & Bond, Kleinfelder, Fay, Spofford & Thorndike (Stantec), and GZA GeoEnvironmental). Many are in close proximity to the Lowell Campus (TRC, Amec Foster Wheeler, AECOM, and Nobis. As well, the public sector is expected to participate as a partner (US EPA Region 1 Headquarters in Boston, US EPA Region 1 Laboratory in North Chelmsford, US Army Corps of Engineers in Concord and MA Department of Environmental Protection offices located throughout the state).

RESOURCES AND BUDGET

Fiscal (Attachment B)

Faculty and Administration (Attachment C)

The proposed B.S.E. / EE program, developed in the Department of Civil and Environmental Engineering, has well-established environmentally-focused M.S. and Ph.D. options. Faculty members who currently teach in those programs will be made available to teach in the proposed program. Additionally, one new tenure-track environmental engineering faculty member was hired in September 2015 and UML is searching for one more environmental engineering tenure-track faculty member scheduled to start in September of 2017. It is expected that at least three more environmental engineering faculty will be sought in successive years. This will bring the total number of environmental engineers in the CEE department to 7.5 full-time faculty. All new environmental engineering faculty members will hold a Ph.D. in Environmental Engineering or closely related field. As well, faculty affiliated with M.S. Environmental Studies program may contribute to the program.

Facilities, Library and Information Technologies

UML plans to develop a specific Environmental Engineering laboratory as part of the renovation of Perry Hall that is currently in the planning stage. The new lab is designed to facilitate all of the lab coursework outlined in the proposed program. It will provide tools such as microscopes and spectroscopy machines for analysis and ovens and centrifuges for sample preparation. Other laboratory classes will be carried out in existing laboratories. All UML students have access to both O'Leary and Lydon Libraries on campus. Lydon Library resides on north campus, which is home to all engineering programs. Lydon houses books and journals in the sciences, engineering, business management, social sciences, humanities, and health. In addition to traditional texts the library provides electronic access to journals, conference proceedings, databases and volumes. Reference librarians are available to support students.

The technology available to students is wide ranging. The Civil and Environmental Engineering department operates a computer lab with over 30 terminals. These provide the opportunity for instruction and project work, accessing the latest technical software for the field, including SolidWorks, MathWorks, MatLab, and AutoCAD. UML's recently opened Makerspace, with tools such as 3D printers, laser cutters, CNC lathes, CNC mills, and wood cutting tools is planned to be available for students in the proposed program.

Affiliations and Partnerships

The Department of Civil and Environmental Engineering (CEE) has an Industrial Advisory Board (IAB) made up of over a dozen senior-level practitioners from industry who review all department level proposals for modifications to the existing curriculum or to provide guidance on any new initiatives to insure that quality is maintained and that proposed material is relevant to industrial needs. The CEE department meets with the IAB members at least once per semester or more often if necessary. The CEE faculty also consults with the IAB on selected issues.

Once the program has obtained BHE approval, UML plans to reach out to local high schools to promote the program and recruit students, by sponsoring special campus visits, providing occasional invited lectures on selected timely topics at local high schools, and similar activities.

PROGRAM EFFECTIVENESS

Goal	Measurable Objective	Strategy for Achievement	Timetable
1. Program Enrollees	1.1. Attract high-quality applicants 1.2. Recruit applicants from traditionally underrepresented groups.	1.1. Recruiting fairs; posters and flyers at schools and professional meetings; media advertising; Web site	3-6 months before admission then ongoing
2. Professional Advancement of Students	1.1. Prepare students academically 2.2. Assist students in obtaining employment 2.3. Maintain student contact and monitor student progress after graduation 2.4. Increase number and quality of employers recruiting BSENVE students 2.5 Graduates increase their professional compensation	2.1. Strong faculty and well-designed curriculum 2.2. Active involvement by Career Services Office; personal contacts 2.3. Newsletters, surveys, social events, LinkedIn. 2.4 Produce high quality graduates with superior skills 2.5. Conduct annual alumni surveys, including compensation history	Prior to implementation and then ongoing
3. Relevance of Curriculum	3.1. Internal Department of Civil and Environmental (CEE) faculty approval 3.2 Approval of the CEE Industrial Advisory Board (IAB) 3.3. Compliance with professional organizations such as the American Society of Civil Engineers (ASCE) and the Accreditation Board for Engineering and Technology (ABET)	3.1. Present the proposal to the CEE faculty. 3.2. Present the proposal to the CEE IAB. 3.3. Review of program implementation against the ASCE standards and ABET standards on a yearly basis	3-6 months before implementation, then ongoing
4. Retention and Graduation	4.1 Higher retention of matriculating students [80%] 4.2 High Graduation rate [70%]	4.1 Recruit high quality applicants with superior skill sets 4.2. Provide readily accessible and timely student advising	ongoing

EXTERNAL REVIEW AND INSTITUTIONAL RESPONSE

The proposed program was reviewed by Amvrossios Bagtzoglou, Ph.D., FASCE, FICE, FAWRA, Professor and Head of the Civil & Environmental Engineering department at the University of Connecticut; Lucas Hellerich, PhD, PE, LEP, Associate Vice President of AECOM (Architecture, Engineering, Construction, Operations, Management) in Chelmsford MA; and Michael Marley, President XDD (Expert Design Diagnostics) Environmental, LLC in Stratham NH.

The team supports the establishment of the proposed B.S.E. / EE program within the CEE department at UML. They noted that the program will serve the needs of the Massachusetts engineering community with students that are prepared to contribute immediately upon graduation to addressing the environmental challenges of the Commonwealth. The reviewers expect that the proposed curriculum is sufficient to initiate the B.S.E. / EE program at this time, provided that faculty lines as proposed are integrated in the program. The team articulated course modifications and additions that should be considered as recommendations going forward. The fact that ABET accreditation will not be determined until after the first cohort of students graduate prompted the team to recommend UML determine whether and how these graduates may sit for the Professional Engineer exam.

UML responded with detailed actions planned and revisions to the proposal addressing all of the concerns noted in the review prior to submitting the final proposal for BHE review. UML noted that while it cannot alter the ABET rules, it will contact the licensing board to determine eligibility of pre-ABET accreditation program graduates to obtain professional licensure.

STAFF ANALYSIS AND RECOMMENDATION

Staff thoroughly reviewed all documentation submitted by the **University of Massachusetts Lowell** and the external reviewers. Staff recommendation is for approval of the proposed **Bachelor of Science in Environmental Engineering** program.

ATTACHMENT A: CURRICULUM

B.S. in Engineering in Environmental Engineering

<i>Required (Core) Courses in the Major (Total # courses required = 34)</i>		
<i>Course Number</i>	<i>Course Title</i>	<i>Credit Hours</i>
BIOL.2100	Biology for Engineers	3
BIOL.2120	Biology for Engineers Lab	1
CHEM.1210	Chemistry I	3
CHEM.1230	Chemistry Lab I	1
CHEM.1220	Chemistry II	3
CHEM.1240	Chemistry Lab II	1
CIVE.1070	Introduction to Engineering	2
CIVE.2860	Prob. & Stat. for Engineers	3
CIVE.3010	Fluid Mechanics	3
CIVE.310x	Material Science for Environmental Engineering	2
CIVE.3320	Environmental Engineering Lab	1
CIVE.3620	Environmental Engineering I	3
CIVE.3720	Civil Engineering Systems	3
CIVE.4600	Water Resources Engineering	3
CIVE.485x	Capstone Design (Env. Eng.)	3
ENGN.2050	Statics	3
ENGN.2070	Dynamics	3
ENVE.2xxx	Environmental Engineering Chemistry	3
ENVE.3xxx	Energy and the Sustainable Environment	3
ENVE.3xxx	Environmental Engineering II	3
ENVE.3xxx	Fluid Mechanics Lab	1
ENVE.3xxx	Groundwater Hydrogeology and Remediation	3
ENVE.3xxx	Biological Processes in Environmental Engineering	3
ENVE.4xxx	Chemical Fate and Transport in the Environment	3
ENVE.4xxx	Air Quality	3
ENVE.4xxx	Environmental Engineering Ethics and Professional Practice	3
ENVE.4xxx	Solid Waste Engineering and Management	3
GEOL.3250	Geology for Engineers	3
MATH.1310	Calculus I	4

MATH.1320	Calculus II	4
MATH.2310	Calculus III	4
MATH.2360/2340	Engineering Differential Equations/ Differential Equations	3
PHYS.1410	Physics I	3
PHYS.1410L	Physics Lab I	1
	Sub-Total Required Credits	91
Elective Courses (Total # courses required = 2) (attach list of choices if needed)		
CIVE.4750	Construction Management	3
CIVE.5270	Geotechnical and Environmental Site Characterization	3
CIVE.5610	Physical and Chemical Treatment Processes	3
CIVE.5620	Physical and Chemical Hydrogeology	3
CIVE.5670	Environmental Aquatic Chemistry	3
CIVE.5680	Environmental Fate and Transport	3
CIVE.5690	Micropollutants in the Environment	3
CIVE.5720	Marine and Coastal Processes	3
CIVE.5730	Solid Waste Engineering	3
CIVE.5750	Groundwater Modelling	3
CIVE.5760	GIS Applications in Civil and Environmental Engineering	3
CIVE.5780	Biological Wastewater Treatment	3
CIVE.5950	Hazardous Waste Site Remediation	3
ENVS.5010	Wetlands Ecology	3
ENVS.5020	Fresh Water Ecology	3
ENVS.5810	Understanding the Massachusetts Contingency Plan	3
GEOL.5100	Glacial and Pleistocene Geology	3
GEOL.5200/GEOL.8220L	Structural Geology and Laboratory	3+1
GEOL.5240	Regional Hydrogeology	3
GEOL.5560	Applied Geophysics	3
	Sub-Total Elective Credits	6
Distribution of General Education Requirements		# of Gen Ed Credits
Arts and Humanities, including Literature and Foreign Languages		15
Mathematics and the Natural and Physical Sciences		
Social Sciences		9

Sub-Total General Education Credits		24
Curriculum Summary		
Total number of courses required for the degree	44	
Total credit hours required for degree	121	
<p>Prerequisite, Concentration or Other Requirements: The UMass Lowell Core weaves seven Essential Learning Outcomes (ELOs) into every student's educational experience. This program will be designed to satisfy these ELOs. For more information see: https://www.uml.edu/Academics/undergraduate-programs/gened/Core-Curriculum/Essential-Learning-Outcomes/default.aspx</p>		

Undergraduate Program Curriculum Outline General Ed courses

Environmental Engineering Gen Ed Courses		
<i>Course Number</i>	<i>Course Title</i>	<i>Credit Hours</i>
ENGL.1010	College Writing I	3
ENGL.1020	College Writing II	3
ECON.2010	Economics I (Microeconomics)(SS)	3
	Gen Ed (AH) elective	3
	Gen Ed (AH) elective	3
	Gen Ed (AH) elective	3
	Gen Ed (SS) elective	3
	Gen Ed (SS) elective	3
	Sub-Total Elective Credits	24

ATTACHMENT B: BUDGET

REVENUE ESTIMATES										
	Year 1		Year 2		Year 3		Year 4		Year 5	
	2018		2019		2020		2021		2022	
<i>Full-Time Tuition Rate: In-State</i>	13,932		13,932		13,932		13,932		13,932	
<i>Full-Time Tuition Rate: Out-of-State</i>	30,500		30,500		30,500		30,500		30,500	
<i>Mandatory Fees per Student (In-state)</i>	375		375		375		375		375	
<i>Mandatory Fees per Student (Out-of-State)</i>	375		375		375		375		375	
<i>FTE # of New Students: In-State</i>	20		25		25		30		35	
<i>FTE # of New Students: Out-of-State</i>	5		5		10		10		10	
<i># of In-State FTE Students transferring in from the institution's existing programs</i>		10		0		0		0		0
<i># of Out-of-State FTE Students transferring in from the institution's existing programs</i>		0		0		0		0		0
Tuition and Fees	Newly Generated Revenue	Revenue from existing programs	Newly Generated Revenue	Revenue from existing programs	Newly Generated Revenue	Revenue from existing programs	Newly Generated Revenue	Revenue from existing programs	Newly Generated Revenue	Revenue from existing programs
First Year Students										
Tuition										
In-State	\$278,640	\$139,320	\$348,300	\$0	\$348,300	\$0	\$417,960	\$0	\$487,620	\$0
Out-of-State	\$152,500	\$0	\$152,500	\$0	\$305,000	\$0	\$305,000	\$0	\$305,000	\$0

Mandatory Fees	\$9,375	\$3,750	\$11,250	\$0	\$13,125	\$0	\$15,000	\$0	\$16,875	\$0
Second Year Students										
Tuition										
In-State			\$278,640	\$139,320	\$348,300	\$0	\$348,300	\$0	\$417,960	\$0
Out-of-State			\$152,500	\$0	\$152,500	\$0	\$305,000	\$0	\$305,000	\$0
Mandatory Fees			\$9,375	\$3,750	\$11,250	\$0	\$13,125	\$0	\$15,000	\$0
Third Year Students										
Tuition										
In-State					\$278,640	\$139,320	\$348,300	\$0	\$348,300	\$0
Out-of-State					\$152,500	\$0	\$152,500	\$0	\$305,000	\$0
Mandatory Fees					\$9,375	\$3,750	\$11,250	\$0	\$13,125	\$0
Fourth Year Students										
Tuition										
In-State							\$278,640	\$139,320	\$348,300	\$0
Out-of-State							\$152,500	\$0	\$152,500	\$0
Mandatory Fees							\$9,375	\$3,750	\$11,250	\$0
Fifth Year Students										
Tuition										
In-State									\$278,640	\$139,320
Out-of-State									\$152,500	\$0
Mandatory Fees									\$9,375	\$3,750
Gross Tuition and Fees	\$440,515	\$143,070	\$952,565	\$143,070	\$1,618,990	\$143,070	\$2,356,950	\$143,070	\$3,166,445	\$143,070
Grants	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Contracts	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

Campus budget allocation	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Other Revenues (specify in cell 54)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total	\$440,515	\$143,070	\$952,565	\$143,070	\$1,618,990	\$143,070	\$2,356,950	\$143,070	\$3,166,445	\$143,070

EXPENDITURE ESTIMATES										
	Year 1 2018		Year 2 2019		Year 3 2020		Year 4 2021		Year 5 2022	
	New Expenditures required for Program	Expenditures from current resources	New Expenditures required for Program	Expenditures from current resources	New Expenditures required for Program	Expenditures from current resources	New Expenditures required for Program	Expenditures from current resources	New Expenditures required for Program	Expenditures from current resources
Personnel Services										
Faculty	\$100,000	\$370,000	\$200,000	\$381,100	\$300,000	\$392,533	\$400,000	\$404,309	\$400,000	\$416,438
Administrators (Senior Director)	\$5,000	\$0	\$5,000	\$0	\$5,000	\$0	\$5,000	\$0	\$5,000	\$0
Support Staff	\$50,000	\$0	\$51,500	\$0	\$53,045	\$0	\$54,636	\$0	\$56,275	\$0
Others	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Fringe Benefits 35.16%	\$54,498	\$130,092	\$90,185	\$133,995	\$125,889	\$138,015	\$161,608	\$142,155	\$162,184	\$146,420
Total Personnel	\$209,498	\$500,092	\$346,685	\$515,095	\$483,934	\$530,548	\$621,244	\$546,464	\$623,460	\$562,858
Operating Expenses										
Supplies	\$0	\$0	\$10,000	\$0	\$10,300	\$0	\$10,609	\$0	\$10,927	\$0
Library Resources	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

Marketing/Promotional Expenses	\$10,000	\$0	\$10,000	\$0	\$10,000	\$0	\$10,000	\$0	\$10,000	\$0
Laboratory Expenses	\$0	\$0	\$20,000	\$0	\$20,600	\$0	\$21,218	\$0	\$21,855	\$0
General Administrative Overhead	\$0	\$20,000	\$0	\$20,000	\$0	\$20,000	\$0	\$20,000	\$0	\$20,000
Other (specify)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total Operating Expenses	\$10,000	\$20,000	\$40,000	\$20,000	\$40,900	\$20,000	\$41,827	\$20,000	\$42,782	\$20,000
Net Student Assistance										
Assistantships	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Fellowships	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Stipends/Scholarships	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total Student Assistance	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Capital										
Facilities / Campus recharges	\$0	\$0	\$250,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Equipment	\$0	\$0	\$0	\$0	\$500,000	\$0	\$0	\$0	\$0	\$0
Other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total Capital	\$0	\$0	\$250,000	\$0	\$500,000	\$0	\$0	\$0	\$0	\$0
Total Expenditures	\$219,498	\$520,092	\$636,685	\$535,095	\$1,024,834	\$550,548	\$663,071	\$566,464	\$666,242	\$582,858
BUDGET SUMMARY OF NEW PROGRAM ONLY										
	Year 1 2018	Year 2 2019	Year 3 2020	Year 4 2021	Year 5 2022					

Total of newly generated revenue	\$440,515	\$952,565	\$1,618,990	\$2,356,950	\$3,166,445	
Total of additional resources required for program	\$219,498	\$636,685	\$1,024,834	\$663,071	\$666,242	
Excess/ (Deficiency)	\$221,017	\$315,880	\$594,156	\$1,693,879	\$2,500,203	\$5,325,135
Justification of Financial Projections:						

ATTACHMENT C: FACULTY

Name of faculty member (Name, Degree and Field, Title)	Tenured Y/N	Courses Taught Put (C) to indicate core course. Put (OL) next to any course currently taught online.	# of sections	Division or College of Employment	Full- or Part- time in Program	Full- or part-time in other department or program	Sites where individual will teach program courses
Brent, Ronald Ph.D. in Mathematics Professor	<input checked="" type="checkbox"/>	MATH.1330 Calculus III MATH.2340 Differential Equations	2 2	College of Sciences	Full-Time	No	Main Campus
Bruell, Clifford Ph.D. in Environmental Engineering, Professor	<input checked="" type="checkbox"/>	CIVE.3620 Environmental Engineering I ENVE.3xxx Ground Water Hydrogeology and Remediation ENVE.4xxx Chemical Fate and Transport in the Environment	3 1 1	College of Engineering	Full-Time	No	Main Campus
Choo, Johanna Ph.D. in Ecology Lecturer	<input type="checkbox"/>	BIOL.2100 Biology for Engineers BIOL.2120 Biology for Engineers Lab	1 2	College of Sciences	Full-Time	No	Main Campus
Danylov, Andriy Ph.D in Physics Lecturer	<input type="checkbox"/>	PHYS.1410 Physics I PHYS.1410L Physics I Lab	2 4	College of Sciences	Full-Time	No	Main Campus
DeStefano, Paul Ph.D. Civil Engineering Lecturer	<input type="checkbox"/>	CIVE.2860 Probability and Statistics for Engineers	2	College of Engineering	Full-Time	No	Main Campus
Gondle, Rajkumar Ph.D. Civil Engineering Lecturer	<input type="checkbox"/>	CIVE.1070 Intro to Engineering	3	College of Engineering	Full-Time	No	Main Campus
Gonzalez-Zugasti, Jennifer MS in Mathematics Lecturer	<input type="checkbox"/>	MATH.1310 Calculus I MATH.1320 Calculus II	2 2	College of Sciences	Full-Time	No	Main Campus
Hartman, Kevin Ph.D. Chemistry Lab Coordinator	<input type="checkbox"/>	CHEM.1230 Chemistry I Lab CHEM.1240 Chemistry II Lab	4 4	College of Sciences	Full-Time	No	Main Campus
Hajduk, Edward Ph.D. in Civil and Environmental Engineering	<input type="checkbox"/>	ENGN.2050 Statics ENGN.2070 Dynamics	3	College of Engineering	Full-Time	No	Main Campus
Kurup, Pradeep Ph.D., Civil Engineering, Professor	<input checked="" type="checkbox"/>	CIVE.310x Material Science for Environmental	3	College of Engineering	Full-Time	No	Main Campus

		Engineering					
Pagsuyoin, Sheree Ph.D., Civil and Environmental Engineering, Assistant Professor	<input checked="" type="checkbox"/>	CIVE.3010 Fluid Mechanics ENVE.3XXX Fluid Mechanics Lab	3 1	College of Engineering	Full-Time	No	Main Campus
Sun, Yuyu Ph.D. in Polymer Chemistry and Physics Associate Professor	<input checked="" type="checkbox"/>	CHEM.1210 Chemistry I CHEM.1220 Chemistry II	2 2	College of Sciences	Full-Time	No	Main Campus
Lori Weeden, M.Sc. Environmental Science, Lecturer	<input type="checkbox"/>	GEOL.3250 Geology for Engineers	3	College of Science	Full-Time	No	Main Campus
Zhang, Xiaoqi Ph.D. in Civil and Environmental Engineering Professor	<input checked="" type="checkbox"/>	CIVE.3320 Environmental Engineering Lab CIVE.4600 Water Resources	3 3	College of Engineering	Full-Time	No	Main Campus