New Program Proposal
Master of Engineering: Civil Engineering with a concentration in Risk Engineering and System Analytics
Clemson University

Summary

Clemson University requests approval to offer the program leading to the Master of Engineering: Civil Engineering with a concentration in Risk Engineering and System Analytics to be implemented in the Fall of 2017. The proposed program is to be offered as a distance education program and provided 100% online. The following chart outlines the stages of approval for the proposal. The Advisory Committee on Academic Programs (ACAP) recommends approval of the proposal. The full program proposal is attached.

Stages of Consideration	Date	Comments
Program Proposal Received	12/1/17	Not Applicable
ACAP Consideration	1/26/17	The Clemson University representative introduced the proposed Master of Engineering program, explaining it is an interdisciplinary degree for working professionals that would be offered exclusively 100% online. Moreover, he explained this degree was indicated as "in demand" by workforce contacts and that the field was growing by 85 jobs per year in South Carolina.
		Commission staff inquired about the differential tuition in the proposal and the representative clarified that the differential refers to the graduate assistants who will help provide instruction.
		ACAP members noted that the workforce data was focused exclusively on South Carolina and encouraged the representative to complement this with Southeast regional data as well.
		After remaining discussion, ACAP voted to approve the program proposal. Staff transmitted remaining questions for additional clarity.
Comments and suggestions from CHE staff sent to the institution	2/1/2017	Staff requested the proposal be revised to address the following information: • Update the employment chart to include a more thorough explanation of total positions available annually; • Review the projected enrollment chart for accuracy and explain how the projections were calculated; • Provide a list of program-specific fees and describe fee usage; And, given the net total of financing minus costs, explain why fees are necessary to support the program; • Explain the increases and decreases in costs for the graduate assistants; • Clarify whether this program uses differential tuition, and, if so,

Stages of Consideration	Date	Comments
		briefly include the rationale for setting tuition rates; and • Add detail for the methods and criteria for the assessment of student learning outcomes section.
Revised Program Proposal Received	2/10/17	The revised proposal satisfactorily addressed the requested revisions.

Recommendation

The staff recommends that the Committee on Academic Affairs and Licensing approve the program leading to the Master of Engineering in Civil Engineering with a concentration in Risk Engineering and System Analytics to be implemented in Fall 2017.

Name of Institution

Clemson University

Name of Program (include concentrations, options, and tracks)

Master of Engineering: Civil Engineering with a concentration in Risk Engineering & System Analytics (M. Eng)

Program Designation

☐ Associate's Degree   ☒ Master's Degree

☐ Bachelor's Degree: 4 Year   ☐ Specialist

☐ Bachelor's Degree: 5 Year   ☐ Doctoral Degree: Research/Scholarship (e.g., Ph.D. and DMA)

☐ Doctoral Degree: Professional Practice (e.g., Ed.D., D.N.P., J.D., Pharm.D., and M.D.)

Does the program qualify for supplemental Palmetto Fellows and LIFE Scholarship awards?

☐ Yes

☒ No

Proposed Date of Implementation	CIP Code
08/01/2017	14.0801

Delivery Site(s)

Clemson University Main Campus (Clemson, SC)
Online Distance Education

Delivery Mode

☐ Traditional/face-to-face*   ☒ Distance Education
*select if less than 50% online   ☒ 100% online

☐ Blended (more than 50% online)

☐ Other distance education

Program Contact Information (name, title, telephone number, and email address)

Dr. Hsein Juang, RESA Faculty Lead and Glenn Professor of Civil Engineering, (864) 656-3322, hsein@clemson.edu
University Contact: Dr. Jeremy King, Associate Provost for Institutional Effectiveness, (864) 656-4592, jking2@clemson.edu

Institutional Approvals and Dates of Approval

University Graduate Curriculum Committee (11/11/16)
College of Engineering, Computer, and Applied Sciences, College Curriculum Committee (10/21/16)
President, 4/1/2016
Provost, 4/1/2016
University Board of Trustees (4/12/16)

Background Information

State the nature and purpose of the proposed program, including target audience and centrality to institutional mission. (1500 characters)

> The Master of Engineering in Civil Engineering with a concentration in Risk Engineering & System Analytics is a multidisciplinary study developed by faculty in the Department of Civil Engineering in collaboration with other engineering and non-engineering faculty. This master's program is closely tied to the Center for Risk Engineering and Systems Analytics (RESA), which is run mainly by the faculty in the Department of Civil Engineering. This master's program is developed to integrate interdisciplinary education and research efforts in risk-related science and engineering to improve the understanding of risks linked to natural and man-made phenomena, mitigate their effects, and to better prepare for, respond to, and recover from disasters.
>
> Risk engineering and analytics is used by insurance and reinsurance companies as part of their strategic planning and execution. While significant advancements have been achieved in evidence-based risk management and decision making, utilizing advanced analytics and incorporating real-time information to target specific economic goals is still in its infancy. This master's program is designed with input from industry leaders and targeted toward post-baccalaureate working professionals in this growing area.
>
> The proposed program supports Clemson University's 2020 Forward foundation of research by creating opportunities for "unique public/private partnerships driven by the University's Innovation Campuses." This master's program will be offered to our Center's partner, American International Group (AIG), and will be marketed and presented to other local and global organizations.

List the program objectives. (2000 characters)

> This master's program is aimed at offering an interdisciplinary education on risk engineering and system analytics, providing students with the knowledge and capability to become experts in their profession, and developing a workforce for risk-related industries. The emphasis of this program is on both analytical skills and practical ability for real world risk assessment and management. The specific objectives of this program are as follows:
>
> 1. Provide the comprehensive knowledge and analytical skills on uncertainty analysis, problem identification, and risk model development.
> 2. Offer the latest theories, methods and tools for risk assessment and risk management.
> 3. Teach the students the science behind, and strategies for, effective risk communication.
> 4. Provide the knowledge on evidenced-based risk management programs for natural and man-made catastrophe, and apply risk management to a specific domain.
> 5. Teach the students the cutting-edge knowledge and technologies for data analysis and system analytics.
> 6. Develop strategies and approaches for enhancing risk management and decision making using data analysis technologies.
> 7. Equip the students with expertise and capability to work in the risk related profession such as underwriters, risk analysts, risk managers, and decision makers.
> 8. Prepare the students as leaders in their professional and civic communities.

Assessment of Need

Provide an assessment of the need for the program for the institution, the state, the region, and beyond, if applicable. (1500 characters)

As part of the Center for Risk Engineering and Systems Analytics (RESA) relationship with its corporate partner American International Group (AIG), identified an industry need for a professional degree in risk engineering and system analytics. This master's program will introduce professionals to measures of risk related to natural hazards that impact our state and region including hurricane modeling, flood risk analysis, and earthquake models. An introduction to the risks associated with human error, supply chain, and data mining will better equip professionals in the healthcare, nuclear, and aeronautical fields in preparing for risk. Emphasis on civil engineering will also equip transportation engineers and urban developers with a means to prepare for and mitigate risk.

This program will initially target our RESA Center's partner, American International Group (AIG), as part of our larger partnership with this organization. Surveys and analysis with AIG indicates that 5-10% of professionals in the risk related fields will benefit from a graduate degree in risk engineering and system analytics, which in their organization alone amounts to 3,000-6,000 employees. Indeed, the strong interest of AIG in this program partially reflects the huge demand from the market for this program.

This program will appeal to professionals throughout the state. Subsequent offerings and marketing to other organizations and students will occur. Professionals at the Savannah River Site, employees of distribution centers across the midlands, the aerospace industry centered in Charleston, professionals of General Electric across the state, professionals at BMW and Fluor in Upstate, to name just a few, will all benefit from this program.

Graduates of this program will be able to find employment or advance to senior leadership positions in the following fields: risk engineering, underwriting, risk management, risk assessment, and system analytics. Employment opportunities abound in many industries for these roles including: insurance, civil engineering, healthcare, nuclear and power, logistics, and transportation.

Employment Opportunities

Is specific employment/workforce data available to support the proposed program?
☒Yes

☐No

If yes, complete the table and the component that follows the table on page 4. If no, complete the single narrative response component on page 5 beginning with "Provide supporting evidence."

Employment Opportunities			
Occupation	Expected Number of Jobs	Employment Projection	Data Source
Construction and extraction	34 / year	Increase by 22.91% from 2012-2022	2015 South Carolina Economic Analysis Report
Architecture and engineering	8 / year	Increase by 10.84% from 2012-2022	2015 South Carolina Economic Analysis Report
Management	15 / year	Increase by 6.76% from 2012-2022	2015 South Carolina Economic Analysis Report
Production	18 / year	Increase by 4.92% from 2012-2022	2015 South Carolina Economic Analysis Report

Provide additional information regarding anticipated employment opportunities for graduates. (1000 characters)

This program intends to develop a workforce with knowledge in both engineering and risk management. For the occupations listed on the 2015 South Carolina Economic Analysis Report (SCEAR2015), construction and extraction, architecture and engineering, management, and production are fields directly influenced by the proposed master's program. The employments in these four fields are expected to increase from 2012 to 2022 by 22.91%, 10.84%, 6.76%, and 4.92%, respectively. The corresponding numbers of employments increase in these fields are 16989, 4160, 7419, and 8889, respectively. We estimate in these fields, 2% of positions are for graduates with expertise in risk engineering and system analytics. The total number of positions per year related to this program is thus estimated to be 75. Following the same methodology, the employment opportunities in the Southeast outside South Carolina is estimated to be 1100 based on projection data from Department of Labor from different states.

Provide supporting evidence of anticipated employment opportunities for graduates, including a statement that clearly articulates what the program prepares graduates to do, any documented citations that suggests a correlation between this program and future employment, and other relevant information. Please cite specific resources, as appropriate. (3000 characters)

Note: Only complete this if the Employment Opportunities table and the section that follows the table on page 4 have not previously been completed.

Will the proposed program impact any existing degree programs and services at the institution (e.g., course offerings or enrollment)?
☐Yes

☒No (It is offered online to targeted groups that are not, and will not be, served by existing programs)

If yes, explain. (500 characters)

List of Similar Programs in South Carolina

Program Name	Institution	Similarities	Differences
Civil Engineering (MS)	Clemson University University of South Carolina The Citadel	Both existing Civil Engineering programs and the proposed RESA program aim to develop experts in the engineering field. Both require sound background knowledge in engineering science, advanced mathematics, and basic science.	The existing MS civil engineering programs intend to develop graduates with expertise in fields such as structural, transportation, environmental, water, and geotechnical engineering. The proposed RESA program is focused on risk modeling and system analytics as applied to civil and other engineering fields and non-engineering fields.
Risk Engineering (PBCERT)	Clemson University	Risk Engineering is a certificate program that is the foundation for the proposed master's program on Risk Engineering and System Analytics.	Risk Engineering is a certificate program that is the foundation for the proposed master's program on Risk Engineering and System Analytics. With additional courses in system analytics and other courses covering more general theories and tools for risk management, the proposed program offers a complete and unique risk-focused Master of Engineering degree program.
Risk Management and Insurance (BSBAdm)	University of South Carolina	Both programs centers on risk management and insurance. Both require sound background in advanced mathematics and basic science. Risk engineering and management is an important field of future employment opportunities.	The existing program is for the BSBAdm degree. It focuses on risk associated with management and finance. The proposed program is for a Master of Engineering degree. The proposed program is closely related to risk associated with natural and engineering systems.
Data Science (BS)	College of Charleston	Both programs intend to develop graduates with expertise in extracting information from data. Both require background in advanced mathematics and basic science.	The existing program is a BS program that focuses on developing skills of mathematics and computer science. Background on engineering and natural catastrophe, and risk and insurance is not required. The proposed program is a master's program focusing on risk engineering and management and evidence-based decision making with analytics skills, in which data mining is one of the tools.

Description of the Program

Year	Fall		Spring		Summer	
	Headcount	Credit Hours	Headcount	Credit Hours	Headcount	Credit Hours
2017	15	45				
2018	30	90	15	45	15	45
2019	45	135	30	90	30	90
2020	60	180	45	135	45	135
2021	60	180	60	180	60	180

Projected Enrollment

Note: In year one, we will not have students enrolled in the spring and summer terms (i.e. student enrollment starts in the fall of year one). Projections were calculated based on demand from industry partners and infrastructure in place to offer the program. Students will only complete 3-credit hours per semester, it is a part-time online program for working professionals. We do not anticipate having students attempt more than one course per semester while working full-time.

Besides the general institutional admission requirements, are there any separate or additional admission requirements for the proposed program?

☒Yes

☐No

If yes, explain. (1000 characters)

Students will be accepted into the program based on the following criteria:
- Meeting all applicable Graduate School requirements for admission
- Application for admission approved by a subcommittee of the Graduate Program Committee of the Department of Civil Engineering
- At least two years of risk-related industry experience
- Applicants GRE scores may be waived if they have completed prior related graduate courses with grades of B or better at Clemson University.

Are there any special articulation agreements for the proposed program?

☐Yes

☒No

If yes, identify. (1000 characters)

Curriculum

Select one of the following charts to complete: Curriculum by Year **or** Curriculum by Category
The curriculum consists of 19 hours of core course work and 12 hours of electives selected by the student and his/her graduate advisory committee.

Course	Title	Credit Hours*	Required	Electives	
CE 8560	Human Factors in Risk Engineering	3	X		
CE 8570	Fundamentals of Uncertainty Modeling	3	X		
CE 8580	Fundamentals for Risk Engineering	3	X		
CE 8590	Quantitative Methods in Risk Engineering	3	X		
CE 8500	Design Thinking for Risk Engineering	3	X		
CE 8700	Capstone Design for Risk Engineering	4	X		
CE 8450	Data Mining for System Analytics	3		X	
CE 8470	Optimization Support Systems	3		X	
CE 8480	Risk Analytics in Supply Chains	3		X	
CE 8490	Enterprise Risk Analytics	3		X	
CE 8420	Natural Catastrophe Risk Analytics	3		X	

Total Credit Hours Required

31

Course Descriptions for New Courses

The following courses have been approved by the curriculum committees and are ready for implementation on approval of the degree program.

Course Name	Description
CE 8500: Design Thinking for Risk Engineering	Design thinking methodology introduced in the context of risk engineering. Emphasis on understanding risk engineering challenges, exposure to tools, brainstorming solutions, designing systems, and engage in continuous short cycle innovation process to continually improve the design. Course offered as contract online course to industry clients, enrollment limited to industry professionals.
CE 8700: Capstone Design for Risk Engineering	Students solve open-ended, real world engineering problems. Team-project including development, project management, and economic decision making. Design and report methodologies for use in work-related projects. Communication skills reinforced through presentation of reports. Course offered as contract online course to industry clients, enrollment limited to industry professionals.
CE 8450: Data Mining for System Analytics	Essential theoretical and practical techniques in data mining, including fundamental concepts in data mining, data preprocessing, characterization and comparison, frequent pattern analysis, classification and prediction, cluster analysis, hypotheses evaluation, feature extraction, outlier analysis, and dimensionality reduction. Course offered as contract online course to industry clients, enrollment limited to industry professionals.
CE 8470: Optimization Support Systems	Development of optimization models to aid in complex decision-making and mitigate risk. Risk measures of basic stochastic and robust optimization models. Soft constraints to measure risk. Implementation of models in software systems in decision support systems. Course offered as contract online course to industry clients, enrollment limited to industry professionals.
CE 8480: Risk Analytics in Supply Chains	Supply chain risk management principles reviewed with an emphasis on the identification, mitigation, and measurement of disruptions on potential supply chain scenarios. Disruptions and risks covered will include those linked to both natural and manmade risks. Course offered as contract online course to industry clients, enrollment limited to industry professionals.
CE 8490: Enterprise Risk Analytics	Study of enterprise risk-management (ERM); ERM process; ERM frameworks, including cooperate governance, line management, portfolio management, risk transfer, and risk analytics; ERM applications including: credit, market, operation risk, business applications, and financial institutions; ERM implementation. Course offered as contract online course to industry clients, enrollment limited to industry professionals.
CE 8420: Natural Catastrophe Risk Analytics	Fundamentals of natural catastrophe modeling, derivation of exceedance probability curve, hazard model, inventory model, vulnerability model, loss model, sources and impact of uncertainties, applications of catastrophe modeling to hurricane and earthquake hazards. Course offered as contract online course to industry clients, enrollment limited to industry professionals.

Faculty

Faculty and Administrative Personnel				
Rank	**Full- or Part-time**	**Courses Taught or To be Taught, Including Term, Course Number & Title, Credit Hours**	**Academic Degrees and Coursework Relevant to Courses Taught, Including Institution and Major**	**Other Qualifications and Comments (i.e., explain role and/or changes in assignment)**
Program Coordinator Professor1	Full-time	CE 8580: Fundamentals of Risk Engineering (3)-Summer	Ph.D. Civil Engineering, Purdue University M.S. Civil Engineering, National Cheng Kung University B.S. Civil Engineering, National Cheng Kung University	Professor jointly employed by the Department of Civil Engineering and RESA. Professor serves in a leadership capacity for M. Eng and for international collaboration initiatives.
Professor 2	Full-time	CE 8450: Data Mining for System Analytics (3)-Spring	Ph.D. Computer Science, University of Central Florida M.S. Computer Science, University of Science and Technology of China B.S. Computer Science, University of Science and Technology of China	Professor to teach course on an overload basis as necessary.
Professor 3 & Chair (IE)	Full-time	CE 8470: Optimization Support Systems (3)-Summer	Ph.D. Industrial and Systems Engineering, Virginia Tech B.S. Mathematical Sciences, Clemson University	Professor to teach course on an overload basis as necessary.

Professor 4	Full-time	CE 8480: Risk Analytics in Supply Chains (3)- Fall	Ph.D. Industrial Engineering, Arizona State University M.S. Operations Research, The University of Texas at Austin B.S. Mechanical Engineering, The University of Texas at Austin	Professor to teach course on an overload basis as necessary.
Professor 5 & Chair (CE)	Full-time	CE 8420: Natural Catastrophe Risk Analytics (3)- Fall	Ph.D. Civil Engineering, Virginia Tech M.S. Civil Engineering, Virginia Tech B.S. Civil Engineering, Virginia Tech	Department chair and director of research center. To offer course on an overload basis.
Professor of Practice 1	Full-time	CE 8570: Fundamentals of Uncertainty Modeling for Risk Engineering (3)- Fall	Ph.D. Civil Engineering, Georgia Tech M.S. Civil Engineering, Utah State University B.S. Civil Engineering, Utah State University	Professor will serve as instructor as part of regular course load or as overload as necessary.
Associate Professor 1	Full-time	CE 8590: Quantitative Methods in Risk Engineering (3)- Spring	Ph.D. Civil Engineering, Michigan Tech M.S. Civil Engineering, Michigan Tech B.S. Civil Engineering, Michigan Tech	Professor will serve as instructor for course as part of regular course load or as overload as necessary.
Assistant Professor 1	Full-time	CE 8560: Human Factors in Risk Engineering (3)- Fall CE 8500: Design Thinking for Risk Engineering (3)-	Ph.D. Industrial Engineering, Clemson University M.S. Industrial Engineering, Clemson	Professor with joint appointment to Civil and Industrial Engineering. Will serve as instructor as part of regular course load or as overload as necessary.

		Spring	University	
		CE 8700: Capstone Design for Risk Engineering (4)- Summer	B.S. Mechanical Engineering, Clemson University	
Adjunct 1	Part-time	CE 8490: Enterprise Risk Analytics (3)- Spring	Ph.D. Industrial Engineering, University of Louisville M.E. Computer Engineering, University of South Carolina B.S. Industrial Engineering, Tennessee Technological University	Adjunct professor to teach course as overload, current appointment at other SC public institution.

Note: Individuals should be listed with program supervisor positions listed first. Identify any new faculty with an asterisk next to their rank.

Total FTE needed to support the proposed program (i.e., the total FTE devoted just to the new program for all faculty, staff, and program administrators):

Faculty	Staff	Administration
3.5	1.1	0.25

*No new hires (existing faculty and staff)

Faculty /Administrative Personnel Changes

Provide a brief explanation of any additional institutional changes in faculty and/or administrative assignment that may result from implementing the proposed program. (1000 characters)

There will be no addition of new faculty and staff, or changes in administrative assignments as a result of implementing this program. Staff and faculty are already in place, funded, and prepared to assume the responsibilities of this programs operations.

Library and Learning Resources

Identify current library/learning collections, resources, and services necessary to support the proposed program and any additional library resources needed. (1000 characters)

The library is a hub of strategic importance for research and scholarship in Clemson University. Currently, the Clemson University Library has over 1.6 million print volumes, 415,000 eBooks, 65,878 eJournals, and approximately 500 databases. There are more than 800 risk related books and journals in the Clemson library, which are enormous resources to support the proposed program. These library collections are sufficient for the proposed program. Additional resources, if needed, can be requested from the Interlibrary Loan Service provided by the Clemson University library, which enables all Clemson University students, faculty, and staff to borrow material from libraries around the world at no cost to them. Students both on and off campus have access to resources needed and the University has experience in delivering the resources to the students.

Student Support Services

Identify academic support services needed for the proposed program and any additional estimated costs associated with these services. (500 characters)

All students are enrolled online and will receive support in the form of academic advising and mentoring from their course instructors, the program coordinator, and other staff members in the Civil Engineering department. Online course delivery is through the University's Learning Management System (Blackboard and/or Canvas), with access to the library system. Further, Clemson Online, a unit to support delivering top-quality online courses, is available to students and instructors. The above services are well-established at Clemson and no additional costs will be incurred.

Physical Resources

Identify any new instructional equipment needed for the proposed program. (500 characters)

There will be no new instructional equipment needed for the proposed program. The Civil Engineering department currently utilizes an Echo 360 lab to record lectures. Some faculty members also have access to Camtasia recording software. There are no additional required materials needed for lab demonstrations and course instruction.

Will any extraordinary physical facilities be needed to support the proposed program?
☐Yes

☒No

Identify the physical facilities needed to support the program and the institution's plan for meeting the requirements, including new facilities or modifications to existing facilities. (1000 characters)

There are no additional facilities needed to support this program. All staff and faculty will be housed in existing office space, and all classes will be held online.

Financial Support

Estimated Implementation Costs by Year						
Category	**1st**	**2nd**	**3rd**	**4th**	**5th**	**Total**
Program Administration	$230,880	$379,275	$488,475	$512,850	$512,850	$2,124,330
Faculty and Staff Salaries	$192,894	$226,398	$260,255	$261,293	$286,756	$1,227,596
Graduate Assistants	$45,648	$57,040	$54,894	$43,133	$43,137	$243,852
Equipment	-	-	-	-	-	-
Facilities	-	-	-	-	-	-
Supplies and Materials	$10,205	$10,209	$10,214	$10,215	$10,215	$51,057
Library Resources	-	-	-	-	-	-
Other*	-	-	-	-	-	-
Total	$479,627	$672,922	$813,838	$827,491	$852,958	$3,646,834
Sources of Financing						
Category	**1st**	**2nd**	**3rd**	**4th**	**5th**	**Total**
Tuition Funding	$786,000	$1,167,000	$1,503,000	$1,578,000	$1,578,000	$6,612,000
Program-Specific Fees	$1,520	$1,480	$1,520	$1,480	$1,480	$7,480
State Funding (i.e., Special State Appropriation)*	-	-	-	-	-	-
Reallocation of Existing Funds*	-	-	-	-	-	-
Federal Funding*	-	-	-	-	-	-
Other Funding*	-	-	-	-	-	-
Total	$787,520	$1,168,480	$1,504,520	$1,579,480	$1,579,480	$6,619,480
Net Total (i.e., Estimated New Costs Minus Sources of Financing)	$307,893	$495,558	$690,682	$751,989	$726,522	$2,972,646

*Provide an explanation for these costs and sources of financing in the budget justification.

Budget Justification

Provide a brief explanation for the other new costs and any special sources of financing (state funding, reallocation of existing funds, federal funding, or other funding) identified in the Financial Support table. (1000 characters)

Note: Institutions need to complete this budget justification *only* if any other new costs, state funding, reallocation of existing funds, federal funding, or other funding are included in the Financial Support table.

The above budget considers a 5-year projection for revenues and costs associated with the Master of Engineering in Civil Engineering with a concentration in Risk Engineering & System Analytics. The budget years (e.g. 1st, 2nd, 3rd, 4th, and 5th) follow the academic calendar beginning in the Fall semester and ending in the summer semester of the subsequent year.

The following assumptions were considered in the development of this budget:
- Each new cohort will consist of 12-15 students.
- M.Eng courses may include non-degree seeking students.
- Development funds (e.g. $4000/course) are only anticipated for 2 courses, the remaining courses have already been developed.
- For each course offering, instructor salary and graduate teaching assistant costs are included. The cost for the graduate teaching assistant (not for the graduate students enrolled in this program) include stipend and tuition remission (GAD).
- A portion of RESA staff salaries are included to facilitate the management of the program, and normal university overhead is included.
- Tuition has been set at $1,000 per credit hour (e.g. $3,000 per 3-credit hour course) based on the range of the prices of similar online courses charged by peer institutions. This online program does not have a differential tuition (e.g., GAD) policy for its student enrollees.
- Program specific fees are revenue collected via invoice from industry partners sponsoring students to offset application fee waivers.

Evaluation and Assessment

Programmatic Assessment: Provide an outline of how the proposed program will be evaluated, including any plans to track employment. Identify assessment tools or software used in the evaluation. Explain how assessment data will be used. (3000 characters)

Program outcomes will be monitored and assessed by the Civil Engineering Department's accreditation coordinator and faculty committee. Assessments and assignments associated with each learning outcome will be compiled, summarized, and analyzed with the assistance of the accreditation coordinator.

Faculty serving as instructors for each course will be asked to ensure their courses comply with professional standards and internal standards for the program. These courses will be assessed using a rubric, and feedback will be delivered to faculty. Additionally, faculty will continue to be reviewed by their respective departments as part of normal departmental processes. Staff members working for the program will undergo annual review in accordance with university and state guidelines.

Surveys and focus groups will be conducted with industry clients (employers) to ensure the program's effectiveness. Student learning outcome assessments are detailed in the table below.

Student Learning Outcomes Assessment

Expected Student Learning Outcomes	Methods of/Criteria for Assessment
Students will be able to analyze and quantify different types of uncertainties, and develop risk models for real world problems.	1. An exam or project from selected courses will be used as an assessment tool. 2. Project assignment in Capstone course will be used as an assessment tool. 3. Survey of graduating students. 4. Alumni of the program will be surveyed three years after completing the degree program.
Students will be able to perform risk assessment and management using different methods and tools.	1. An exam or project from selected courses will be used as an assessment tool. 2. Project assignment in Capstone course will be used as an assessment tool. 3. Survey of graduating students. 4. Alumni of the program will be surveyed three years after completing the degree program.
Students will be able to develop science-based strategies to communicate risk with different shareholders efficiently and effectively.	1. An exam or project from selected courses will be used as an assessment tool. 2. Project assignment in Capstone course will be used as an assessment tool. 3. Survey of graduating students. 4. Alumni of the program will be surveyed three years after completing the degree program.
Students will be able to develop evidence-based risk management programs for natural and man-made catastrophe, and apply risk management to a specific domain.	1. An exam or project from selected courses will be used as an assessment tool. 2. Project assignment in Capstone course will be used as an assessment tool. 3. Survey of graduating students. 4. Alumni of the program will be surveyed three years after completing the degree program.
Students will be able to use cutting edge methods and technologies for data analysis and system analytics related to risk management.	1. An exam or project from selected courses will be used as an assessment tool. 2. Project assignment in Capstone course will be used as an assessment tool. 3. Survey of graduating students. 4. Alumni of the program will be surveyed three years after completing the degree program.
Students will be able to enhance risk management through use of the latest tools and technologies of data analysis and system analytics.	1. An exam or project from selected courses will be used as an assessment tool. 2. Project assignment in Capstone course will be used as an assessment tool. 3. Survey of graduating students. 4. Alumni of the program will be surveyed three years after completing the degree program.
Students will be able to enter risk-related professions such as underwriters, risk analysts, risk managers, and decision makers.	1. Survey of graduating students. 2. Alumni of the program will be surveyed three years after completing the degree program.
Students will be able to serve and become leaders in their professional and civic communities.	1. Survey of graduating students. 2. Alumni of the program will be surveyed three years after completing the degree program.

Performance Targets for Assessment:

As the M-Eng program is started, the following assessment thresholds will be set. As with typical assessment efforts, these thresholds will be refined once some history has been established with the program.

1. For course artifacts, the performance target is that at least 90% of the students will perform at a satisfactory level or above (satisfactory performance is usually seen as a score of 80/100, but the actual level used will be set by the course instructor).
2. For the student and alumni surveys, the target threshold for any of the measures is that at least 75% of those surveyed either agree or strongly agree with the survey statements.

Assessment Frequency:

Evaluation of the performance measures will occur on an annual basis. However, the collection of the assessment data will be collected on the following schedule:
1. Scores on course artifacts will be collected at the time the course is taught
2. The graduating student survey will be conducted each semester that there is a graduating class
3. The alumni survey will occur on an annual basis.

Will the proposed program seek program-specific accreditation?
☐Yes

☒No

If yes, provide the institution's plans to seek accreditation, including the expected timeline for accreditation. (500 characters)

Will the proposed program lead to licensure or certification?
☐Yes

☒No

If yes, explain how the program will prepare students for licensure or certification. (500 characters)

Teacher or School Professional Preparation Programs

Is the proposed program a teacher or school professional preparation program?
☐Yes

☒No

If yes, complete the following components.

Area of Certification

| |
| |

Please attach a document addressing the South Carolina Department of Education Requirements and SPA or Other National Specialized and/or Professional Association Standards.