1. **COVER PAGE**

a) Name of Institution - University of South Carolina Aiken

b) Name of Degree – Industrial Process Engineering

c) Date of Submission – September 15, 2014

d) Institutional Signatures

Harris Pastides, President	Date
Sandra Jordan, Chancellor	Date

e) Contact – Dr. Jeffrey M. Priest
Executive Vice Chancellor for Academic Affairs
University of South Carolina Aiken
471 University Parkway
Aiken, SC 29801
803-641-3755
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2. CLASSIFICATION

a) Program Title – Bachelor of Science in Industrial Process Engineering
b) Concentrations/Options/Tracks – None
c) Academic Unit in which the program resides – Department of Mathematical Sciences
d) Designation, Type, and Level of Degree – 4-year, Baccalaureate
e) Proposed Date of Implementation – Fall 2015
f) CIP Code – 14.3501
g) Site – University of South Carolina Aiken
h) Program Qualifications – Qualifies for supplemental Fellows Scholarship and Life Scholarship
i) Delivery Mode – Traditional
j) Area of Certification – Not Applicable

3. INSTITUTIONAL APPROVAL

USCA Monday Group: September 25, 2013
USCA Department of Mathematical Sciences: January 13, 2014
USCA Academic Council: March 4, 2014
USCA University Planning Committee: March 17, 2014
USCA Courses and Curricula Committee: March 17, 2014
USCA Faculty Assembly: April 2, 2014
USCA Chancellor: April 2, 2014
USC System Provost: February 27, 2014
USC System President: March 3, 2014
USC System Academic Affairs and Faculty Liaison Committee: March 28, 2014
USC System Board of Trustees: April 25, 2014

4. PURPOSE

a) Purpose

Over the past several years Aiken County has developed into a technology center for business and government. The listing of businesses in the area that depend on technology include Savannah River National Laboratory, Savannah River Nuclear Solutions, Savannah River Remediation, Tognum America Inc., BAE Systems, South Carolina Gas and Electric; Kimberly-Clark's Consumer Health Services; Bridgestone Passenger and Truck Tire Facility; AGY Materials Corporation; Shaw Industries; Washington Safety Management Solutions Corporation; Hubbell Power Systems; and Harvey Ignition Systems Engineering Corporation. Collectively these industries employ over 16,000 individuals and each industry is driven by its technology innovations, which come from the employment of its engineering and scientific staff.

In fall 2012, the University of South Carolina Aiken (USCA) conducted a visioning process that involved over 700 stakeholders in the region. The purpose of the visioning process was to get input from stakeholders on what USCA does well, where it can improve, and where it should go in the future. Through the visioning process seven themes occurred: grow the university, increase program/degree offerings, increase faculty/staff salaries, market the university more widely, improve the current funding/budget situation, improve community relations/increase partnerships, and revamp the current administrative/governance structure. Within each of these themes, numerous recommendations were made. For the increase program/degree

offerings theme, an undergraduate engineering program was the top recommendation for every constituent group (students, faculty, administrators, business/industry, community leaders).

As a result, an engineering advisory group made up of engineer leaders in businesses such as Savannah River National Laboratory, Savannah River Nuclear Solutions, Savannah River Remediation, BAE Systems, Kimberly-Clark, Tognum America Inc., URS, and Bridgestone was formed. During the 2012-2013 academic school year, this group aided in the development of the proposed baccalaureate industrial process engineering program. The charge assigned to this group was to help develop a program whose graduates they would want to hire for their businesses. The result was the development of the Industrial Process Engineering Program with a mission to prepare engineering students who have the technical knowledge and skills in mathematics, science, engineering and management to analyze and solve problems in today's team oriented business environment. Through a rigorous curriculum students will be provided multiple opportunities to apply knowledge and skills learned in the classroom and laboratory in real world settings.

This same committee also suggested the name of the degree. They felt it was important for the title to describe not only the course topics but the career destinations of our graduates. The industrial process engineers will be prepared to oversee, develop, enhance, and design processes found in industry relating to people, products, economics, and knowledge. The title for our degree indicates learning to achieve knowledge in the processes of industry from multiple viewpoints: mechanical, manufacturing, and business.

b) Objectives

The goals for developing the Industrial Process Engineering Program are:

1. Provide an opportunity for local high school students and technical college students to participate in a local 4-year engineering program.
2. Address a need as identified by local businesses and industries.
3. Aid the economic development of the CSRA by providing a program that can help attract and retain industries and engineers.

Program educational objectives:

1. Provide students with the technical knowledge and skills in mathematics, science, and engineering to analyze and solve problems.
2. Provide engineering students with a strong liberal arts background.
3. Provide students with practical experience and organizational skills, enabling them to interact and communicate both orally and in writing to others.
4. Provide students with the skills to work effectively in cross-functional team environments.

Long-term program objectives: Within 3-5 years of graduation, graduates of this program will have:

1. Attained positions that utilize the skills learned in this program.
2. Roles of increasing responsibility leading to leadership positions.
3. Pursued professional development, certifications, and/or licenses in engineering or related areas by attending graduate school or continuing education opportunities.
4. Served the profession, community, and society by demonstrating professional and ethical responsibilities.

5. **JUSTIFICATION**

a) Employability of Graduates:

In the fall 2012, USCA hired Carnegie Communications to do a productivity demand study and an environmental scan for a series of possible degree programs, one of which was engineering. According to the study, which drew heavily from the Bureau of Labor Statistics Occupational Employment Statistics Classification system, over the next 10 years, 68,000 new engineering jobs and 38,000 replacement jobs will become available. In the Central Savannah River Area, the Carnegie study indicates that there will be an estimated 333 engineering job openings (114 new, 219 replacement). Potential employers for our graduates will be URS Corporation, Savannah River Remediation, Energy Solutions, BUNTY LLC Engineered Solutions, Savannah River Nuclear Solutions, Southeastern Clay Company, Kimberly Clark, Bridgestone Tire, AGY Materials, Shaw Industries, and Tognum America, to name a few.

A job search conducted on November 8, 2013 through Careerbuilder.com indicates more engineering related job openings as predicted by the Bureau of Labor Statistics. A search on that website yielded the following results:

Job Prompt	CSRA	South Carolina	Georgia	North Carolina
Industrial Engineer	8	181	270	171
Process Engineer	39	415	879	466
Mechanical Engineer	19	211	269	173

b) Centrality with Mission:

USC Aiken was founded in 1961 as a result of the local community coming together to ask the state legislature to approve a degree granting institution to meet the needs of the area. Since it opened its doors, USC Aiken has developed into a comprehensive liberal arts institution committed to active learning through excellence in teaching, faculty and student scholarship, research, creative activities, and service. The University offers degrees in the arts and sciences and in the professional disciplines of business, education, and nursing. All courses of study are grounded in a liberal arts and sciences core curriculum. USCA also encourages interdisciplinary studies and collaborative endeavors. As a community based institution, USCA strives to meet the needs of the community.

Historically, there has been a significant demand for engineering degree opportunities among non-traditional students who are employed in the Central Savannah River Area. Recognizing this demand, USC Aiken has for more than twenty years offered a schedule of engineering courses which includes evening study, however USCA currently offers only freshman- and sophomore-level engineering courses. However, after completion of the courses that are available at the Aiken campus, both non-traditional and traditional students are faced with the need to complete their degree programs through daytime study at USC Columbia or some other institution that has a four year degree, a situation that usually presents the students with unsolvable logistic and financial problems. Traditional and non-traditional students who, due to financial, family, or other circumstances, are unable to relocate also find themselves with no

alternative means of earning an engineering degree. We also believe that students educated in Aiken are more likely to stay in Aiken for their career in engineering.

c) Relationship to Related Programs Within the Institution:

As mentioned in the previous section, for the past 20 years, USC Aiken has offered the freshman and sophomore years of a general engineering program that enabled students to transfer to USC Columbia or other engineering programs throughout the state. The proposed program builds on the current program so that students who want to transfer to another institution may continue to do so.

d) List of Similar Programs within South Carolina

Currently Clemson University is the only ABET accredited institution in the state that offers Industrial Engineering. Francis Marion University was just approved for an Industrial Engineering program this past year. Of the two programs, Francis Marion's program is of similar size and scope. However because of the geographic distance between our campuses and the emphasis of regional recruitment, we don't believe we will be in direct competition. There are no other similar programs in the state. A complete listing of the engineering programs as taking from the CHE program inventory are listed in the table below.

Table 1 – Engineering Degrees available in South Carolina as listed in CHE program inventory

	Bob Jones	Clemson	USC Columbia	The Citadel	Claflin	Benedict College	Anderson	Furman	USC Upstate	Francis Marion	South Carolina State
Engineering	x										
Biosystems Engineering		x									
Biomedical Engineering			X								
Chemical Engineering		x	x								
Civil Engineering		x	x	x							
Computer Engineering	x	x	x		x	x					
Broadcast Engineering Management	x										
Electrical Engineering	x	x	x	x							
Engineering Physics						x					
Engineering Science	x										
Environmental Engineering		x									
Materials Science and Engineering		x									
Mechanical Engineering		x	x	x							
Nuclear Engineering											x
Industrial Engineering		x								x	
Pre-Engineering							x	x			
Civil Engineering Technology											x
Electrical Engineering Technology											x
Electrical and Electronic Engineering Technologies											
Industrial Engineering Technology											x
Mechanical Engineering Technology											x
Engineering Technology Management									x		
Engineering Technology										x	
Materials Science and Engineering		x									

e) Similarity and Differences with other programs – Private, SREB ACM, & Proprietary:

A search on the ABET program listing site indicates that there are 97 institutions within the United States that offer Industrial Engineering at the undergraduate level. Clemson is the only institution within South Carolina that is listed. There are two institutions in North Carolina (North Carolina Agricultural and Technical State University and North Carolina State University in Raleigh) and one institution in Georgia (Georgia Institute of Technology).

A search of the Southern Regional Education Board's Academic Common Market yielded no results for industrial engineering.

6. ADMISSION CRITERIA

Admission requirements to the engineering program will be those of entering freshman at USC Aiken. High school course selection, standardized test scores, and an Admissions Index are all used to determine admissibility. In addition to these students must have taken the following in high school: English (4 units), mathematics (4 units), laboratory science (3 units), social science (3 units), foreign language (2 units), academic electives (4 units), and physical education or ROTC (1 unit).

Engineering majors must have a grade of "C" or better in all mathematics, science, and engineering courses. If a student fails to receive a "C" or better, they must repeat the courses until they receive a "C" or better.

7. ENROLLMENT

a) Projected Enrollment

Table A – Projected Total Enrollment

PROJECTED TOTAL ENROLLMENT						
YEAR	**FALL**		**SPRING**		**SUMMER**	
	Headcount	Credit Hours	Headcount	Credit Hours	Headcount	Credit Hours
2015-16	90	1575	90	1525	0	0
2016-17	102	1755	102	1705	0	0
2017-18	102	1755	102	1705	0	0
2018-19	102	1755	102	1705	0	0
2019-20	102	1755	102	1705	0	0

b) Origin of Students

Our current pre-engineering program averages 100 students each year. Conservatively, we expect that number to stay consistent. Based on surveying our students, we are making an

assumption that approximately 60% of the sophomores will continue with us for their junior year. Then most of those will succeed and continue to the senior year.

Year 1 - 50 freshman, 25 sophomores, 15 juniors (Assumes 15 current sophomores stay with the program)
Year 2 – 50 freshman, 25 sophomores, 15 juniors, 12 seniors
Year 3 – 50 freshman, 25 sophomores, 15 juniors, 12 seniors
Year 4 - 50 freshman, 25 sophomores, 15 juniors, 12 seniors
Year 5 - 50 freshman, 25 sophomores, 15 juniors, 12 seniors

We don't expect many, if any, transfers from other programs on campus.

c) New and Transfer Students

To be conservative, we don't expect an influx of many new or transfer students into the program. There may be a handful, but we are being conservative on the estimates.

8. **CURRICULUM**

a) Sample Curriculum

USC Aiken Proposed Industrial Process Engineering Program of Study

Year 1 (35 Credit Hours)					
Fall			Spring		
ENGL 101	Composition	3	ENGL 102	Composition	3
MATH 141	Calculus I	4	MATH 142	Calculus II	4
ENCP 101	Introduction to Engineering I	3	ENCP 102	Intro to Engineering II	3
CHEM 111	Chemistry I	4	CHEM 112	Chemistry II	4
Elective	Humanities	3	ECON 221/222	Micro or Macro Economics Elective	3
AFCI	Critical Thinking	1			
Total Semester Credit Hours		18	Total Semester Credit Hours		17
Year 1 Summer Internship Opportunity					
Year 2 (34 Credit Hours)					
Fall			Spring		
PHYS 211	Physics I	4	PHYS 212	Physics II	4
MATH 241	Calculus III	4	MATH 242	Calculus IV (Differential Equations)	4
ENCP 200	Statics	3	ENGR 290	Thermodynamics	3
EMCH 371	Engineering Materials	3	ENGR 260	Mechanics of Solids	3
COMM	COMM 201 or 241	3	Elective	Humanities	3
Total Semester Credit Hours		17	Total Semester Credit Hours		17
Year 2 Summer Internship Opportunity					

Year 3 (30 Credit Hours)					
Fall			Spring		
BADM 371	Principles of Management and Leadership	3	ENCP 310	Dynamics (ENCP 210)	3
ELCT 221	Electrical Circuits	3	EMCH 327	Design of Mechanical Elements	3
EMCH 360	Fluid Mechanics	3	ENGR 380	Intro to Systems Engineering	3
ENGR 361	Instrumentation, Measurements, & Statistics	3	ENGR 334	Quality Planning and Control	3
STAT 509	Statistics	3	Elective	History 101 or 102	3
Total Semester Credit Hours		15	Total Semester Credit Hours		15
Year 3 Summer Internship Opportunity					
Year 4 (30 Credit Hours)					
Fall			Spring		
ENGR 498	Capstone Design I	3	ENGR 499	Capstone Design II	3
ENGR 316	Control Systems	3	BADM 494	Project Management	3
Elective	Technical Elective	3	Elective	Technical Elective	3
Elective	Social/ Behavioral Science Elective	3	ENGR 421	Engineering Economics	3
Elective	American Political Institutions Elect.	3	PHIL 325	Engineering Ethics	3
Total Semester Credit Hours		15	Total Semester Credit Hours		15

Technical Elective Courses (6 Credit Hours)					
EMCH 354	Heat Transfer	3	ENGR 477	Advanced Manufacturing	3
ENGR 454	Unit Operations	3	STAT 510	Statistical Quality Assurance	3
EMCH 377	Manufacturing Processes	3	MGMT 475	Production/Operations Management	3

b) New Courses*

Year 1

ENCP 101 – Introduction to Engineering I
Engineering problem solving using computers and other engineering tools.

ENCP 102 – Introduction to Engineering II
Principles and practice of visualization and graphical representation using modern computer-aided design software.

Year 2

ENCP 200 – Statics (pre: MATH 141)
Introduction to the principles of mechanics; equilibrium of particles and rigid bodies; distributed forces, centroids, and centers of gravity; moments of inertia of areas; analysis of simple structures and machines; and friction.

ENCP 260 – Introduction to the Mechanics of Solids (pre: MATH 241, ENCP 200 with a C or better)
Basic concepts of stress and strain. Stress and strain transformation concepts. Basic developments for stresses. Tension, torsion, axial load, and pressure. Deformations of elastic relationships between stress and strain.

ENCP 290 – Thermodynamic Fundamentals
Definitions, work, heat, and energy. First law analyses of systems and control volumes. Second law analysis. and design.

EMCH 371 – Engineering Materials* (pre: ENCP 260)
Structures and properties of engineering metals, ceramics, and polymers; atomic bonding, crystalline structures and microstructures; mechanical behavior and deformation mechanisms; processes for controlling structures and properties; corrosion.

Year 3

ELCT 221 – Circuits (pre: MATH 142)
Linear circuit analysis and design.

EMCH 327 – Design of Mechanical Elements* (pre: ENCP 260)
Design against static failure and fatigue failure of structural members and machine parts: design and selection of components including fasteners, welds, shafts, springs, gears, bearings, and chain drives.

ENCP 310(210) – Dynamics (pre: ENCP 200 with a C or better)
Kinematics of particles and rigid bodies. Kinetics of particles with emphasis on Newton's second law: energy and momentum methods for the solution of problems. Applications of plane motion of rigid bodies.

ENGR 334 – Quality Planning and Control* (pre: STAT 509)
Introduction to quality management philosophies, tools, and approaches. Six Sigma philosophy, roadmap, tools, and techniques of planning and executing quality improvement programs and the LEAN continuous improvement approach that focuses on reducing waste. Application of Design for Six Sigma approach to design or improve products and processes.

EMCH 360 – Fluid Mechanics* (pre: MATH 241, ENCP 200 with a C or better)
Mechanical engineering applications of fluid statics and dynamics. Conservation of mass, momentum, and energy. Similitude and dimensional analysis, open channel flow, lift and drag. Introduction to turbulent flow.

ENGR 361 – Instrumentation, Measurements, & Statistics* (pre: STAT 509, PHYS 212, ELCT 221; co: ENCP 260, ENCP 290)
Principles of measurement, analysis of data, experimental planning. Correlations of experimental data, experimental variance, and uncertainty analysis. Lab and lecture.

BADM 371 - Principles of Management and Leadership (pre: Junior standing)
A comprehensive survey of the basic principles of management and leadership applicable to all forms of business. The course provides the student with a basis for thinking about complex business situations in the framework of analysis of the management and leadership process.

ENGR 380 – Introduction to Systems Engineering* (pre: MATH 242, STAT 509, ENGR 334)
An integrated introduction to systems methodology, design, and management. An overview of systems engineering as a professional and intellectual discipline, and its relation to other disciplines, such as operations research, management science, and economics. An introduction to selected techniques in systems and decision sciences, including mathematical modeling, decision analysis, risk analysis, and simulation modeling. Overview of contemporary topics relevant to systems engineering such as reengineering and total quality management. Elements of systems management, including decision styles, human information processing, organizational decision processes, and information system design for planning and decision support.

Year 4

ENGR 316 –Control Systems (pre: MATH 242, ENGR 330, ELCT 221)
An introduction to closed-loop control systems; development of concepts, including transfer function, feedback, frequency response, and system stability by examples taken from mechanical engineering practice; control system design methods. Also an introduction to programmable logic controllers (PLCs). *[EMCH 516 Control Theory]*

PHIL 325 - Engineering Ethics*
An investigation of ethical issues in engineering and engineering-related technology. Topics include whistleblowing, employee/employer relations, environmental issues, issues related to advances in information technology, and privacy.

ENGR 421 – Engineering Economics & Finance* (pre: ECON 221 or 222)
Decision making with respect to capital goods, with emphasis on such decision making in governmental activities and public utilities. Intended primarily for engineering students, the course emphasizes the types of investment decisions that engineers are often called upon to make.

BADM 494 Project Management (pre: BADM 371)
A study of general principles of project management which includes concepts related to management of technology, people, stakeholders and other diverse elements necessary to successfully complete the project. The student will explore both technical and managerial challenges involved in managing projects

ENGR 498 - Capstone Design I*
An integral part of the education provided to undergraduates in engineering is a senior two-semester course sequence in "capstone" design. The objectives of the sequence are to:

1. Require application of the knowledge gained in earlier courses to the design process.
2. Familiarize the student with the engineering design process: Definition, Synthesis, Analysis and Implementation.
3. Improve communication skills.
4. Promote organizational skills.
5. Stress importance of other influences on design such as economics, reliability, performance, safety, ethics and social impacts.
6. Simulate the post graduate job environment.

The design projects are selected from problems submitted by the students, faculty and local industry. Industry projects are given preference since these projects are best suited for meeting the course objectives.

ENGR 499 – Capstone Design II*
An integral part of the education provided to undergraduates in engineering is a senior two-semester course sequence in "capstone" design. The objectives of the sequence are to:

1. Require application of the knowledge gained in earlier courses to the design process.
2. Familiarize the student with the engineering design process: Definition, Synthesis, Analysis and Implementation.
3. Improve communication skills.
4. Promote organizational skills.
5. Stress importance of other influences on design such as economics, reliability, performance, safety, ethics and social impacts.
6. Simulate the post graduate job environment.

The design projects are selected from problems submitted by the students, faculty and local industry. Industry projects are given preference since these projects are best suited for meeting the course objectives.

<u>Technical Electives</u>

EMCH 354 – Heat Transfer* (pre: MATH 242, ENCP 290, EMCH 360,)
One- and two-dimensional steady and unsteady conduction; free and forced convection; boiling and condensation; heat exchangers.

ENGR 454 – Unit Operations* (pre: EMCH 354, EMCH 360, ENCP 290)
This course presents the standard unit operations in chemical and metallurgical systems and discusses the principles governing fluid flow, heat transfer, mass transfer, thermodynamic and mechanical processes. The design and operation of the devices for these unit operations is emphasized and the course will discuss the application to such areas as fluid transportation, evaporation, distillation, refrigeration and solids.

EMCH 377 – Manufacturing Processes (pre: EMCH 371)
Basic principles of metal processing; applied mechanics of metal cutting and forming; cost analysis of manufacturing operations.

ENGR 477 – Advanced Manufacturing (co: ENGR 334)
In-depth study of the planning and method of selection and sequencing of various chip generating and assembly processes in order to produce a product with the highest usable quality at the lowest cost. Workplace design, assembly, and inspection features and positioning devices analyzed. Advanced techniques involving robotics and computers used in developing manufacturing processes.

STAT 510 – Statistical Quality Assurance (pre: STAT 509 with C or better)
Basic graphical techniques and control charts. Experimentation in quality assurance. Sampling issues. Other topics include process capability studies, error analysis, estimation and reliability.

MGMT 475 Production/Operations Management (pre: BADM 296 and BADM 371)
A study of the strategic, operating, and control decisions involved in manufacturing and service organizations. Topics include forecasting, process development, production technology, resource allocation, facility planning, facility layout, planning systems, inventory systems, resource requirements planning systems, shop floor planning, scheduling operations, just-in-time manufacturing, materials management, productivity control, quality management, quality control, project management, and maintenance management.

9. **ASSESSMENT**

a) Student Learning Outcomes

ABET requires the following student learning outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
(d) an ability to function on multidisciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning

(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

b) Programmatic Assessment:

USC Aiken will take the following measures to assess the engineering program:

1. Continue the engineering advisory board that consists of engineers from local businesses and industry. The role of the advisory board will be to help USCA review the curriculum, review assessment data, and provide recommendations to ensure our graduates remain relevant to local business and industry.
2. Monitor the number of majors and program graduates.
3. Survey employers of our engineering graduates.
4. Survey our graduates.
5. Monitor the number of graduates who obtain Professional Engineering Certification.
6. Regularly monitor facilities and equipment.

c) Data Driven Programmatic Changes:

1. Student and program data will be reviewed on an annual basis and changes made as appropriate.
2. Although ABET will not accredit a program until there are program graduates, USCA will seek accreditation as soon as it can. As with all accreditation processes, this will provide another form of program assessment.

10. **FACULTY**

a) Faculty List

Table B – Engineering Faculty List

List Staff by Rank	Highest Degree Earned	Field of Study	Teaching in Field (Yes/No)
Assistant Professor #1	Ph.D.	Mechanical Engineering	Yes
Assistant Professor #2	Ph.D.	Industrial/Process Engineering	Yes
Assistant Professor #3	Ph.D.	Industrial/Process Engineering	Yes

b) New Faculty:

USC Aiken will hire two additional tenure track faculty for the program. Expectation is for each to have a terminal degree (Ph.D.) in Industrial Engineering or other engineering discipline that supports the program. One hire will be made for Fall 2015 and one for Fall 2016.

c) Existing Faculty:

Currently, USCA has one tenure track faculty member on staff who currently teaches the freshman and sophomore level engineering classes for our current two year program. The

business/management classes, (Engineering Economics and Finance, Supply Chain Management and Logistics, Business Relationships) will be taught by current faculty in the School of Business. Classes will be part of current teaching load. If necessary, qualified part-time faculty will be used to teach classes.

d) Faculty Development:

Each unit on campus is allocated $400 per full time faculty member for professional development. In addition to this amount, the university, through it's partnership funds, has provided additional funding that faculty can apply for. This amount has averaged approximately $65,000/year over the past five years. Therefore faculty, on average, get approximately $800-$1000 for professional development activities.

e) Full-time Equivalent Definition:

A full-time equivalent faculty member for a full-time instructor, tenure track and tenured faculty at USCA teaches 12 contact hours each fall and spring semester for a total of 24 contact hours per academic school year. This normally equates to 4 courses each semester.

f) Unit Administration, Faculty, and Staff Support:

UNIT ADMINISTRATION, FACULTY, AND STAFF SUPPORT						
YEAR	NEW		EXISTING		TOTAL	
	Headcount	FTE	Headcount	FTE	Headcount	FTE
Administration						
2015-2016			1	.5	1	.5
2016-2017			1	.5	1	.5
2017-2018			1	.5	1	.5
2018-2019			1	.5	1	.5
2019-2020			1	.5	1	.5
Faculty						
2015-2016	1	1	1	1	2	2
2016-2017	1	1	2	2	3	3
2017-2018			3	3	3	3
2018-2019			3	3	3	3
2019-2020			3	3	3	3
Staff						
2015-2016			1	.33	1	.33
2016-2017			1	.33	1	.33
2017-2018			1	.33	1	.33
2018-2019			1	.33	1	.33
2019-2020			1	.33	1	.33

11. **PHYSICAL PLANT**

a) Existing Facility

USCA has six buildings that house academic units. There are 41 classrooms, 5 auditoriums, 14 labs, and 8 computer classrooms that are designated as academic areas. All classrooms and auditoriums are wired for computers and have LCD projection systems. The 8 computer classrooms house 141 computers.

The program will be part of the Department of Mathematical Science which is housed in the Penland Building. Engineering classes will continue to be held in the Penland Building as they have for the past 25 years. Classroom space is adequate.

b) Facility Modification

A classroom has been identified that will be outfitted with lab tables and electricity to accommodate for additional engineering activities. Additional lab space is available in the science building in the physics classroom if needed. Funding for this modification will be a reallocation of internal resources as well as some external funding that has been raised for the program.

12. **EQUIPMENT**

The following materials/equipment/software will be purchased over the next few years to support the program:

Software – Pro/ENGINEER (Creo Parametric), MatLab - $75,000
Measuring Equipment - $25,000
Laboratory Equipment - $65,000
3D Printer - $125,000
Large Format Printer - $5,000
Additional Equipment/materials to be identified - $50,000

13. LIBRARY RESOURCES

a) Current Holdings:

Library Resources for New Program Proposal: B.S. in Industrial Process Engineering

The Gregg-Graniteville Library occupies a recently renovated two-story 40,000 square foot building situated on the main university quadrangle. The Gregg-Graniteville Library is an official depository for Federal and South Carolina documents. The library is open 78 hours per week with variations during exam periods, inter-sessions, summer terms, and holidays.

a) qualitative and quantitative assessment of current holdings in view of the program being proposed.

The Gregg-Graniteville Library collection currently contains:

Print Volumes (Books/Serials): 211,251	E-Books: 62,626
Microform Units: 79,896	AV Units: 4,088
Databases (including PASCAL and DISCUS): 252	E-Journals: 29,776

Our current monograph holdings (print and electronic) in areas related to Engineering, subdivided by subject include:

Technology (General) -- (Library of Congress Call# Subclass T): 724 volumes
Engineering (General) (Library of Congress Call# Subclass TA): 1119 volumes
Hydraulic Engineering (Library of Congress Call# Subclass TC): 48 volumes
Environmental Technology (Library of Congress Call# Subclass TD): 451 volumes
Highway Engineering (Library of Congress Call# Subclass TE): 13 volumes
Railroad Engineering (Library of Congress Call# Subclass TF): 16 volumes
Bridge Engineering (Library of Congress Call# Subclass TG): 17 volumes
Building Construction (Library of Congress Call# Subclass TH): 84 volumes
Mechanical Engineering (Library of Congress Call# Subclass TJ): 624 volumes
Electrical Engineering (Library of Congress Call# Subclass TK): 2029 volumes
Motor Vehicles (Library of Congress Call# Subclass TL): 348 volumes
Mining Engineering (Library of Congress Call# Subclass TN): 112 volumes
Chemical Technology (Library of Congress Call# Subclass TP): 332 volumes
Total monographs (print and electronic) holdings: 5917 volumes

A qualitative examination of the titles in the USCA collection was conducted comparing our current holdings with those in *Resources for College Libraries (RCL)*. RCL is a collaboration between *Choice*, a publishing division of the Association for College and Research Libraries (ACRL) and Bowker, a leading publisher in bibliographic authority. The RCL is the premier core list for academic libraries. *RCL* is a highly selective core list of close to 60,000 titles across subject areas representing essential texts for academic libraries, particularly for those of small liberal arts colleges. When the USCA library holdings were compared with the titles in *Resources for College Libraries*, the results in the relevant areas were as follows:

LC Classification	Total # of Volumes Owned	% of Core Titles Owned (Resources for College Libraries)
(T1-995)Technology (General)	724	9%
(TA1-2040)Engineering (General). Civil engineering (General)	1119	5%
(TC1-978)Hydraulic engineering	48	0%
(TC1501-1800)Ocean engineering	0	0%
(TD1-1066)Environmental technology. Sanitary engineering	451	12%
(TE1-450)Highway engineering. Roads and pavements	13	0%
(TF1-1620)Railroad engineering and operation	16	0%
(TG1-470)Bridge engineering	17	25%
(TH1-9745)Building construction	84	2%
(TJ1-1570)Mechanical engineering and machinery	624	5%
(TK)Electrical Engineering	2029	6%
(TL) Motor Vehicles	348	5%
(TN) Mining Engineering	112	12%
(TP) Chemical Technology	332	10%

The majority of the Engineering related collection (58%) was published between 2000 and 2010. 12% of the collection was published since 2010.Qualitatively, our current monographs collection is strongest in the areas of Sanitary Engineering, Bridge Engineering and Mining Engineering. Quantitatively our holdings are strongest in General/Civil Engineering and Electrical Engineering, Our current monographs collection needs to be strengthened to include

more current and quality titles particularly in the areas of Mechanical and Electrical Engineering. This would require an estimated $5,000 additional funds per year.

Current databases or e-journal packages with Engineering-related materials currently accessible to USCA students include:

ACS Web (American Chemical Society)
Science Direct
SpringerLink
Wiley Online Library
SciFinder Scholar
MathSciNet
Web of Knowledge

Our electronic databases are not currently adequate for the proposed degree. To adequately support the degree and its emphasis on Mechanical Engineering, subscriptions to the following resources are strongly recommended:

Compendex (via Elsevier's Engineering Village platform) = $28,904
INSPEC (via Elsevier's Engineering Village platform) = $7,735
Standards and Engineering Digital Library (SEDL) (from the American Society for Testing and Materials (ASTM) = $16,200
American Society of Mechanical Engineers (ASME) Journal Package = $8,511

Should the degree continue to expand to include more of a focus on Electrical Engineering, the following resource should also be adopted:
Institute of Electrical and Electronics Engineers (IEEE) Digital Library

The prices quoted here are for 2014. Database costs generally rise 3-6% annually.

Current journal holdings

The library currently subscribes directly to four serial subscriptions in the area of Engineering including:

Chemical Engineering
IEEE Spectrum
Civil Engineering
Mechanical Engineering

In addition to these titles, USCA faculty and students have access to approximately 1,428 other serial titles relevant to Engineering through our full-text databases and consortial journal packages.

b) New Acquisitions

	1st year	2nd year	3rd year	4th year	5th year	Total
Monograph purchases	**$5,000**	**$5,000**	**$5,000**	**$5,000**	**$5,000**	**$25,000**
Database subscriptions	**$61,350**	**$61,350**	**$61,350**	**$61,350**	**$61,350**	**$306,750**
TOTAL	**$66,350**	**$66,350**	**$66,350**	**$66,350**	**$66,350**	**$331,750**

c) PASCAL:

USCA maintains a formal written agreement with all universities and colleges in South Carolina, the Partnership Among South Carolina Academic Libraries (PASCAL http://pascalsc.org/), which supports both consortial purchasing of databases and statewide borrowing of materials. PASCAL Delivers provides for reciprocal library borrowing among private and public colleges/universities throughout the state. It is supported by a statewide courier service which

makes book deliveries to campuses five days a week. The majority of our databases relevant for the proposed degree are not impacted by PASCAL.

Additional services
Using ILLIAD, a web-based Interlibrary Loan system, librarians fill requests for articles or documents that are scanned and transmitted via Ariel software. USC Aiken belongs to the KUDZU Consortium of southeastern libraries, providing delivery of items not available within the state to faculty and students within a few days.

The library maintains an active program of research assistance and instruction. The library faculty support classroom instruction in the disciplines and offer both general and course-specific library instruction. Instruction sessions are tailored to the needs of the course and the specific requirements of individual faculty members with the stated purpose of enabling all members of the college community to achieve information literacy in preparation for lifelong learning in a changing and global society.

14. ACCREDITATION, APPROVAL, LICENSURE, OR CERTIFICATION

a) Accreditation:
USC Aiken will seek accreditation from ABET the Accrediting Board for Engineering and Technology. According to the ABET web-site (http://www.abet.org/accreditation-timeline/) it takes approximately 18 months to complete the accreditation process. The process can be initiated once the first students graduate from the program. Under the proposed timeline, the first students could graduate in spring 2017. According to the ABET guidelines the accreditation process includes the following:

a. Readiness Review (one year before on-site visit)
b. Request for Evaluation (nine months prior to visit)
c. Self Study Report (six months prior to visit)
d. On-site visit
e. Draft statement provided by ABET (two to three months after visit)
f. Institutional response to draft statement (three to four months after visit)
g. Institution receives accreditation notification (August)

b) Licensure:
According to the National Society of Professional Engineers web site (http://www.nspe.org/resources/licensure/what-pe), to become a licensed engineer a person must:

☐ Earn a four-year degree in engineering from an accredited engineering program
☐ Pass the Fundamentals of Engineering (FE) exam
☐ Complete four years of progressive engineering experience under a PE
☐ Pass the Principles and Practice of Engineering (PE) exam

The first graduates of USC Aiken's engineering program will be eligible to take the engineering exam in 2021.

c) Teacher Preparation – Not applicable.

15. ARTICULATION

a) Associate-level to Baccalaureate:
Not applicable. USC Aiken does not offer an associates degree.

b) Entry from two-year institutions:
USC Aiken has developed the program so that the students in the pre-engineering program at Aiken Technical College can transfer into the program without losing any credit. A formal memorandum of understanding between USC Aiken and ATC is included in the appendix.

c) Terminal degree:
This degree is not a terminal degree.

d) MOUs:
USC Aiken has signed a MOU with Aiken Technical College. Students in ATC's pre-engineering program will be able to transfer into USC Aiken's engineering program without losing any credit.

Additionally, for the past 25 years, USC Aiken has offered a two-year pre-engineering program where students could transfer to USC Columbia's engineering program. Students will still be able to transfer to USC Columbia after successfully completing the first two years of this program.

e) Explanation:
USC Aiken will continue to offer the pre-engineering program for those students wanting to transfer to USC Columbia. USC Aiken has a MOU with Aiken Technical College for students in their engineering program to transfer into our program.

f) Articulation with the South Carolina Transfer and Articulation Center
Within 18 months of the implementation of a new academic program, articulation information regarding the program will be posted to the online South Carolina Transfer and Articulation Center as required by CHE.

16. **ESTIMATED COSTS AND SOURCES OF FINANCING**

a) Estimated Costs and Financing

Table D – Estimated Costs and Sources of Financing by Year

ESTIMATED COSTS BY YEAR					
CATEGORY	**2015-2016**	**2016-2017**	**2017-2018**	**2018-2019**	**2019-2020**
Program Administration	45,720	47,090	48,500	49,960	51,460
Faculty Salaries	407,250	544,560	560,470	577,470	594,830
Part-Time Faculty Salaries	15,000	15,480	15,960	16,440	16,920
Graduate Assistants	-	-	-	-	-
Clerical/Support Personnel	14,980	15,430	15,890	16,370	16,860
Supplies and Materials	100,000	125,630	128,770	131,990	135,290
Library Resources	66,350	68,010	69,710	71,450	73,230
Equipment	345,000	51,250	52,530	53,840	55,190
Facilities	50,000	50,000	-	-	-
Other (Identify)	-	-	-	-	-
TOTALS	**1,044,300**	**917,450**	**891,830**	**917,520**	**943,780**
SOURCES OF FINANCING BY YEAR					
Tuition Funding	765,720	897,400	928,000	958,600	990,220
Program-Specific Fees	27,750	35,850	35,850	35,850	35,850
State Funding*	-	-	-	-	-
Reallocation of Existing Funds**					
Federal Funding	-	-	-	-	-
Other Funding (Specify)***	250,830				
TOTALS	**1,044,300**	**933,250**	**963,850**	**994,450**	**1,026,070**
FUND BALANCE IMPACT	**-**	**15,800**	**72,020**	**76,930**	**82,290**

***Private sources

b) Assumptions

- We expect to maintain approximately 100 students in the program. To be conservative, we are assuming all students will be paying in-state tuition.
- Uses current tuition rate of $9018/year and 3% increase each year of program.
- Establishes a $100 majors fee for freshman/sophomores.
- Establishes a $300 majors fee for juniors/seniors
- Establishes a $10/credit hour lab fee for 100/200 level engineering courses
- Establishes a $25/credit hour lab fee for 300/400 level engineering courses

c) Special State Appropriations

USC Aiken does not plan to request additional state appropriations.

d) Institutional Funding and Other Sources

Funding for the program is from three sources; reallocation of current general revenue, tuition generated from engineering majors, and private sources of funding. Since USC Aiken already has a pre-engineering program, classroom and lab space already exists to support the program. The addition of two new faculty members will be accomplished by reallocating funds to convert a current instructor slot in mathematics to a tenure track engineering slot. The second new faculty member will be funded through reallocation of existing funds. These are reflected in the budget table.

To date USC Aiken has raised over $800,000 for the program from businesses such as URS and Savannah River Remediation and from individuals. Half of those funds are for use in support of the program to help purchase lab equipment and materials to support the upper level courses the other half is for scholarships and endowed professorships. Once the program is approved, USC Aiken believes it will be able to raise significant additional funding to support the program.

In addition, local business/industries have indicated they are willing to offer lab space if needed in the future.

17. **PROGRAMS FOR TEACHERS AND OTHER SCHOOL PROFESSIONALS**

Not applicable to this proposal.