WHALIN, JSU

DHS Coastal Resilience Center

Education Project:

Year 2 Annual Project Performance Report

Covers reporting period July 1, 2016 – June 30, 2017

1. **Project Title:**

   PhD in Engineering (Coastal Engineering and Computational Engineering concentrations) at an HBCU.

2. **Principal Investigator / Institution:**

   Robert W. Whalin, Ph.D., P.E., D.CE Professor of Civil Engineering; Co-Director, Coastal Hazards Center of Excellence-Education (July 1, 2008-Dec. 31, 2017); Education Director, Coastal Resilience Center of Excellence (Jan. 1, 2016- June 30, 2020).

3. **Other Education Participants/Partners:**

   US Army Engineer Research and Development Center (ERDC), University of North Florida and Texas A&M University at Galveston

4. **Short Project Description:**

   This project establishes the first HBCU PhD in Engineering degree with concentrations focusing on coastal natural disasters. It will help increase workforce diversity (over 80% of students are minorities) in the Homeland Security enterprise. The PhD Engineering degree will have two coastal natural disaster related concentrations: Coastal Engineering (focusing on hurricanes and floods) and Computational Engineering (focusing on computational fluid dynamics) and continues to nurture the BS/MS education programs of the Coastal Hazards Center of Excellence (July 1, 2008-Dec. 31, 2015). End user (employers) relationships with ERDC, Mississippi Department of Transportation (MDOT), Corps of Engineers Districts, Mississippi Emergency Management Agency (MEMA) and local emergency management offices across the southeastern US are strengthened even further.

5. **Abstract:**

   This project will formulate and implement a concentration in Coastal Engineering for the PhD Engineering degree and will promote the approved Computational Engineering Concentration. These two PhD concentrations will have a pipeline of graduates from the MS Engineering (Coastal Engineering and Computational Engineering concentrations) plus government and industry employees within the commuting area as a steady source of students. The BS and MS programs were formulated and implemented during the DHS Coastal Hazards Center of Excellence (July 1, 2008-Dec. 31, 2015) at Jackson State University and will continue to be nurtured and strengthened as part of the academic

foundation for the CRC. This is the only natural disaster focused coastal engineering and computational engineering graduate (or undergraduate) program at an HBCU and is a direct result of DHS Office of University programs support for Centers of Excellence. Jackson State University has a minority student population exceeding 80% which directly supports the DHS Strategic Plan Goal to Enhance the DHS Workforce, especially the Objective to Increase Workforce Diversity and Priority Goal 3 to Enhance Resilience to Disasters. Leverage of federal assets is assured by the Education Partnership Agreement (authorized by Public Law) between the Engineer Research and Development Center and Jackson State University that facilitates ERDC engineers serving as Adjunct Faculty, providing student internships and potential use of ERDC experimental and computational facilities for graduate research. An outstanding record of DHS End User involvement and transition of graduates to end users has been established during the seven and one-half years of the Coastal Hazards Center of Excellence at Jackson State University and will continue to be strengthened throughout the five-year Coastal Resilience Center of Excellence program. Research staff and graduate students have a direct participation in at least one research partners project and in highly relevant hurricane barrier projects nationwide (funded by others) including the Ike Dike concept for protecting Galveston Island and the greater Houston metropolitan area from devastating, albeit low probability, hurricane surges. Coastal Engineering programs nationwide have been on a decline for the past two decades and United States leadership in the coastal engineering profession has declined relative to other nations. This project will help ameliorate that trend while increasing the supply of minority coastal and computational graduate level engineers focused on the field of coastal natural disasters.

6. End users:

End User	Agency/Employer	Project Role
	FEMA Region IV	Transition, employer
BG (Ret) Robert Crear Chairman, Free Flow Power Development, LLC	Free Flow Power	Collaborator (guest lecturer), Transition (helps students with internships/employment).
Mr. Mark Sanders GIS Specialist	MEMA	Collaborator, Transition (employer and co-author).
Assistant Professor USCG Academy	USCG Academy	Collaborator, potential co-author & intern employer
Branch Chief, Vicksburg District	USACE	Transition (employer)
Ms. Jennifer Constantine, Senior Association Coordinator	Louisiana Emergency Preparedness Association	Collaborator (potential employer).
Mr. John T. Weeks, PE Vice President	SDW	Transition employer
Special Assistant to Vice Commandant	USCG	Collaborator, coordinator with Commandant Office
Jocelyn Pritchett, PE President	Pritchett Engineering and Planning, LLC	Transition, employer of interns and graduates.

Director	ERDC	Transition, signatory for ERDC Education Partnership Agreement with JSU
Director Emeritus, ERDC	ERDC, Retired	Collaborator.
Director, Coastal and Hydraulics Laboratory (CHL)	ERDC	Transition; CHL is source of Adjunct faculty, graduate students and employs JSU interns and graduates
Director, Information Technology Laboratory (ITL)	ERDC	Transition; ITL employs interns & graduates. Approver for Computational assets/use
Director, Geotechnical and Structures Laboratory (GSL)	ERDC	Transition; GSL employs interns & graduates.
Director of Human Capital	ERDC	Transition, Key person in strategic recruitment
Research Engineer	ERDC	Graduate Adjunct Professor
	ERDC	Undergraduate Adjunct Professor.
	ERDC	Graduate Adjunct Professor
	ERDC	Graduate Adjunct Professor
	ERDC	Transition; Guest Lecturer

7. Unanticipated Problems:

Jackson State University experienced severe unanticipated fiscal challenges and leadership changes during Year 2. Our President resigned in November 2016 amid very public media reports of an 89% decrease in operating funds from ($37M to $4M) over a four year period and a less than two week backlog of operating funds. To further accelerate the fiscal challenges the Governor decreased university funds (all state universities) three times during Year 2. An interim President was appointed (retired Dr. Rod Paige, former US Secretary of Education) and a new President was announced the first week of June 2017, effective July 1, 2017. These challenges caused numerous university wide fiscal limitations and typical blanket policy responses that are impossible to challenge. It was deemed unwise to submit documentation requesting a new PhD concentration among the Year 2 fiscal turbulence even though the cost to the university for the program is, for all practical purposes zero. The plan to address this challenge was/is to delay submission of documentation for the PhD Coastal Engineering concentration until July 2017. This strategy should not impact the Year 4/5 goals relating to PhD graduates. We already have two PhD students enrolled in the PhD Civil Engineering concentration that will change their concentration to coastal engineering immediately on approval. At least one additional PhD student will begin in Fall 2017.

8. **Project Impact:**

The major impact of this project on current workforce capabilities will be to start providing a relatively steady supply of, mostly minority, graduate coastal engineers for the greater Homeland Security (HS) enterprise. Four graduate students who completed all required Coastal Engineering concentration courses were awarded MS Engineering degrees during year 2, and all four are continuing their graduate education and pursuing a PhD Engineering degree. A fifth (African American) engineer will receive his MS Engineering (Coastal Engineering concentration) degree in Year 3 in December 2017. He is employed full time in the HS enterprise by the U.S. Army Corps of Engineers, Vicksburg District. At or before, as scheduled, the conclusion of year 5, we project that one or more PhD Engineering degrees will be awarded. At the current time I have three PhD students enrolled and taking classes and one more will enroll in fall 2017. There are very, very few African American coastal engineers in the United States. This project will make a substantial contribution to resolving that shortage.

Almost all universities use slight variations of the following processes to ensure courses incorporate pertinent literature advances in the field and contain state of the art content. The very strict ABET engineering accreditation process reviews each engineering degree program every six years (or sooner if weaknesses were detected). The review process includes a review of a large 3 ring binder (can be electronic) for each class which contains, lectures, homework assignments, final exams, required technical papers/presentations, notes; quizzes; tests electronic media if used and all material used or provided the students. Three samples of student work on every assignment (excellent, average and below average) are requirement. The ABET evaluators have an entire day to review this material uninterrupted. Evaluators interview each professor that teaches in the program. This process forces an update of each course syllabus at least every six years. Practically speaking, each course is likely revised every two or 3 years. The other independent Accreditation process is the SACS (Southern Association of Colleges and Schools) that accredits every university in the southeastern US every ten years. While quite rigorous and trending, more and more to duplicate ABET accreditation processes it is less often and less intense out of necessity since it covers every program (undergraduate and graduate) at a university. Beyond these, each professor is expected to keep current in their area of expertise and to keep current in their field. In addition to annual evaluations, this includes five-year, post-tenure reviews, to determine if they remain tenured professors or are placed on a performance improvement plan. This includes five year reviews for tenured professors. In order to maintain a Professional Engineer License (all Civil Engineering professors at Jackson State University are Registered Professional Engineers in at least one state), an average of 15-20 Professional Development Hours (PDH) are required annually (two hours must be engineering ethics hours). There are slight variations in the number of hours from state to state. In my specific case, I have been granted the status of Diplomate in the specialty of Coastal Engineering by the Academy of Coastal, Ocean, Port and Navigation Engineers (ACOPNE). This particular Certification was granted on June 5, 2014 and must be renewed every two years with at least 32 PDH hours. ABET accreditation is by far the most intensive and most rigorous degree program

accreditation of any university major.

9. Education Activity and Milestone Progress:

The university fiscal challenges caused numerous actions including a hiring freeze, temporary policy to have no Adjunct Professors teach classes, a reversal of granting out of state tuition waivers for STEM majors, salary freezes, and reductions in force. It was deemed (by the PI) to not be a prudent time to submit documentation for a new degree concentration. A new President has been hired effective July 1, 2017. Documentation submittal for the Coastal Engineering concentration of the PhD Engineering degree program was delayed until July 2017. It will not progress past the college until after the 2017-2018 school year begins during the fall semester and it is envisioned that it should proceed in an orderly manner at that time. This delay will not impact PhD degree award milestones in Years 4 & 5.

Education Activities and Milestones: Progress to Date

Reporting Period 7/1/16 – 6/30/17			
Education Activity	Proposed Completion Date	% Complete	Explanation of why activity / milestone was not reached, and when completion is expected
Prepare Coastal Engineering concentration documentation	12/30/16	100%	
Submit Coastal Engineering documentation for approval	1/1/17	0%	Although preparation was completed 100%, the submittal date was delayed to July 2017 by PI due to university fiscal challenges described above that likely would have precipitated an undesired response.
Continue to Teach BS/MS classes	6/30/17	100%	
Seek research funds from outside sources	continuous	100%	
Education Milestone			
Continue to graduate students enrolled in BS/MS Coastal Engineering classes	5/30/17	100%	
Receive approval for Adjunct professors	12/30/16	100%	
Receive approval for PhD Coastal Engineering concentration	6/30/17	0%	Completion expected 05/15/18 due to university fiscal challenges described previously.

Schedule first PhD level new class	6/30/17	100%	CIV 632 Tides and Long Waves is being offered for the first time in Fall 2017 (8 students enrolled)

10. Transition Activity and Milestone Progress:

Enrollment of students in the BS/MS coastal engineering courses continued. Two enrolled BS students graduated and two enrolled MS students graduated. Mr. Rahmatullah Faizi graduated in Dec. 2016 and Ms. Mireille Tchuisseu graduated on April 30, 2017. Both students graduated with a MS Engineering (Coastal Engineering concentration) degree. Each are working fulltime in the greater Jackson Metropolitan area. One is working in the greater Homeland Security enterprise with a local civil engineering industrial firm and the other is a rising employee of Nissan Inc. Both graduates were recipients of scholarship funds provided by the DHS Education and Workforce Development Program managed by Ms. Stephanie Willett, DHS. Each applied for admission to the JSU PhD Engineering program and each has been accepted. They will be part time PhD graduate students in Fall 2017 and are enrolled in two courses each for the Fall 2017 semester. I am their graduate (PhD) advisor. We had two other MS Engineering degrees awarded in Dec. 2016 where the graduates completed all requirements for the Coastal Engineering concentration; however, they chose to graduate in the Civil Engineering concentration. I was/am a member of their Graduate committee; although not the Chair. These students were Mr. Xuesheng Qian and Ms. Lei Bu. Both are pursuing their PhD Engineering degree.

Transition Activities and Milestones: Progress to Date

Reporting Period 7/1/16 – 6/30/17			
~~Transition Activity~~	Proposed Completion Date	% Complete	Explanation of why activity / milestone was not reached, and when completion is expected
Continued enrollment of students in BS/MS programs	6/30/17	100%	
Transition Milestone			
Graduation of BS/MS students and employment in the greater HS enterprise or continued graduate school enrollment.	6/30/17	100%	

11. Interactions with research projects:

During the summer of 2016 (June 1 thru Aug. 10), Mr. Xuesheng Qian, a Civil Engineering (Water Resources Engineering concentration) PhD student was a JSU CRC SUMREX (Summer Research Experience) student at the University of Texas working with Dr. Clint Dawson and his team performing ADCIRC hurricane surge modeling research in the Gulf of Mexico. Mr. Qian has taken every coastal engineering and computational engineering graduate course offered at JSU and has honed his computational fluid dynamics skills quite remarkably. He is projected to graduate in Dec. 2017. Ms. Sabrina Welch is a JSU SUMREX student during the summer of 2017 working with Dr. Stephen Medeiros and his teaching assistant at the University of Central Florida (May 21 to June 10) and with Dr. Scott Hagen and his research team at LSU (June 11 to June 30) in the ADCIRC modeling SUMREX program they started last summer. Ms. Welch is joined by another graduate student from University of Puerto Rico, Mayaguez in this excellent UCF/LSU SUMREX program.

Ms. Welch attended the ADCIRC Boot Camp and Users Group meeting held in Boston, MA (May 1 to May 5, 2017) and had the opportunity to meet Dr. Leuttich, CRC PI and Dr. Chris Massey, ERDC and other key researchers and graduate students using the ADCIRC modeling system. This summer's activities for Ms. Welch and her year 2 coursework are a very deliberate plan to prepare her to use the ADCIRC modeling system as part of her PhD dissertation. Ms. Welch was admitted directly to the PhD Engineering graduate program based on her exemplary undergraduate Civil Engineering degree performance (Summa Cum Laude).

The talents of our CRC Senior Research staff member, Br. Bruce Ebersole, were utilized to help mentor Ms. Sabrina Welch in her learning process of applying ADCIRC to the Houston/Galveston, TX area. Leveraged funds from the first two research projects in Table 2 were used to fund Mr. Ebersole plus some funds from the CRC research project of Dr. Resio at University of North Florida.

We plan to incorporate an ADCIRC oriented computational fluid dynamics class as an elective in our PhD Coastal Engineering concentration in either year 3 or year 4 of the CRC. The course would be taught by Dr. Chris Massey, ERDC, who is an approved Adjunct Professor at JSU.

Dr. Gavin Smith, CRC Director gave a seminar at Tougaloo College on April 7, 2017 at which a number of JSU CRC professors, staff and graduate students attended. All coastal engineering staff, graduate students and professors were invited.

In summary, students in this Education Project have benefitted from research project interactions at University of Texas, University of Central Florida, Louisiana State University, University of North Florida and University of North Carolina. Additional student research interactions occurred with renowned engineers at ERDC (a partner) and students and professors from Texas A&M, Texas A&M Galveston, Rice and Technical University, Delft in The Netherlands (leveraged interactions from the first project in Table 2).

12. Publications:

- Whalin RW. HBCU Engineering Faculty and Graduates: Implications for Race, Retention and Graduation Linkages, NAAAS & Affiliates 2016 National Conference Proceedings, Baton Rouge, LA, published Oct. 2016.
- Whalin RW, Pang Q, Latham J, Lowe LN. Assessment of a Summer Bridge Program: Seven Years and Counting, 2017 ASEE National Conference Proceedings, Columbus, OH, June 24-28, 2017.
- Whalin RW, Brody SD, and Merrell WJ. The Galveston Bay Region as an International Test Bed for Flood Risk Reduction, 8th Texas Hurricane Conference, University of Houston, Houston, TX, August 5, 2016.
- Ebersole B, Richardson TW, and Whalin RW. Modeling Coastal Storms: Past, Present and Future, 8th Texas Hurricane Conference, University of Houston, Houston, TX, August 5, 2016

13. Tables:

Table 1: Documenting CRC Education Project Courses and Enrollments

Courses Developed and Taught by Jackson State University under Project PhD in Engineering (Coastal Engineering and Computational Engineering concentration) at an HBCU						
Course		Developed (D), Revised (R), and/or Taught (T), by Project Year				
Number	Title	1	2	3	4	5
CIV631	Linear Theory of Ocean Waves	T	T			
Offering: Elective (E), Concentration (C), Minor (M)		C	C			
Enrollment		6	5			
CIV637	Advanced Design for Breakwater Rehabilitation	T	-			
Offering: Elective (E), Concentration (C), Minor (M)		C	-			
Enrollment		3	-			
CIV642	Prestressed Concrete Design	T	-			
Offering: Elective (E), Concentration (C), Minor (M)		E	-			
Enrollment		4	-			
CIV698	Independent Study (4 separate courses)	T/R (4 courses)	T/R (4 courses)			
Offering: Elective (E), Concentration (C), Minor (M)		C	C			
Enrollment		1 each	1 each			
CIV538 Spring 17	Coastal Structures	-	T			

Offering: Elective (E), Concentration (C), Minor (M)		-	C			
Enrollment		-	6			
CIV636 Fall 16	Spectral Wave Analysis	-	T			
Offering: Elective (E), Concentration (C), Minor (M)		-	C			
Enrollment		-	5			
CIV539 Fall 16	Advanced Coastal Engineering Design	-	T			
Offering: Elective (E), Concentration (C), Minor (M)		-	C			
Enrollment		-	6			
CIV520	Advanced Engineering Analysis	-	T			
Offering: Elective (E), Concentration (C), Minor (M)		-	C			
Enrollment		-	9			
CIV535	Pavement Design	-	T			
Offering: Elective (E), Concentration (C), Minor (M)		-	E			
Enrollment		-	8			
CIV542	Advanced Design of Concrete Structures	-	T			
Offering: Elective (E), Concentration (C), Minor (M)		-	E			
Enrollment		-	9			
CIV544	Advanced Design of Steel Structures	-	T			
Offering: Elective (E), Concentration (C), Minor (M)		-	E			
Enrollment		-	8			
CIV544	Advanced Design of Hydraulic Structures	-	T			
Offering: Elective (E), Concentration (C), Minor (M)		-	E			
Enrollment		-	9			
Total		17	69			

Table 2: Documenting External Funding and Leveraged Support

External Funding			
Title	PI	Total Amount	Source
Coastal Flood Risk Reduction	Robert W. Whalin	$99,514	Texas A&M University, Galveston (NSF PIRE)
Hurricane Storm Surge Study for Galveston Bay, TX	Robert W. Whalin	$26,524	Texas A&M University

Maritime Transportation and Education Center (MarTREC)	Feng Wang (PI) Robert W. Whalin (Co-PI)	$185,000	University of Arkansas (Tier 1) UTC
Southeastern Transportation Research, Innovation Development and Education Center (STRIDE)	Feng Wang (PI) Robert W. Whalin (Co-PI)	$112,150	University of Florida (Regional) UTC
Total		$423,188	
*UTC- US Department of Transportation, University Transportation Center			

Leveraged Support

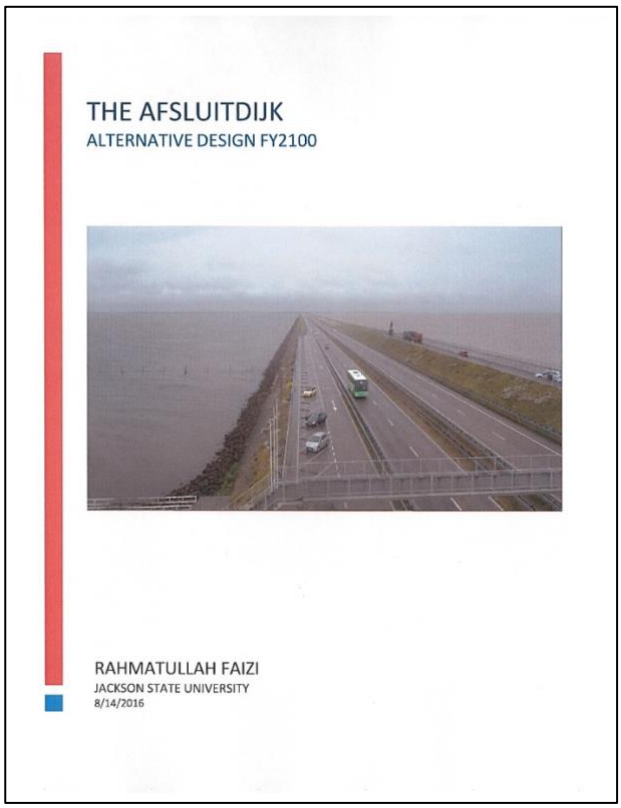
Description	Estimated Annual Value
High Performance Computer Time (No Cost)	$36,000

14. Metrics:

Metric	**Year 1** (1/1/16 – 6/30/16)	**Year 2** (7/1/16 – 6/30/17)
HS-related internships (number)	5	4
Undergraduates provided tuition/fee support (number)	1	0
Undergraduate students provided stipends (number)	0	0
Graduate students provided tuition/fee support (number)	4	7
Graduate students provided stipends (number)	2	6
Undergraduates who received HS-related degrees (number)	2	3
Graduate students who received HS-related degrees (number)	0	4
Certificates awarded (number)	0	0
Graduates who obtained HS-related employment (number)	1	2
Lectures/presentations/seminars at Center partners (number)	1	1
DHS MSI Summer Research Teams hosted (number)	0	0
Journal articles submitted (number) (includes peer-reviewed conference proceedings)	2	0
Journal articles published (number) (includes peer-reviewed conference proceedings)	2	4
Conference presentations made (number)	2	4
Other presentations, interviews, etc. (number)	5	3
Trademarks/copyrights filed (number)	0	0
Requests for assistance/advice from DHS agencies (number)	0	4
Requests for assistance/advice from other agencies or governments (number)	0	3
Total milestones for reporting period (number)	3	4
Accomplished fully (number)	2	3
Accomplished partially (number)	1	0
Not accomplished (number)	0	1

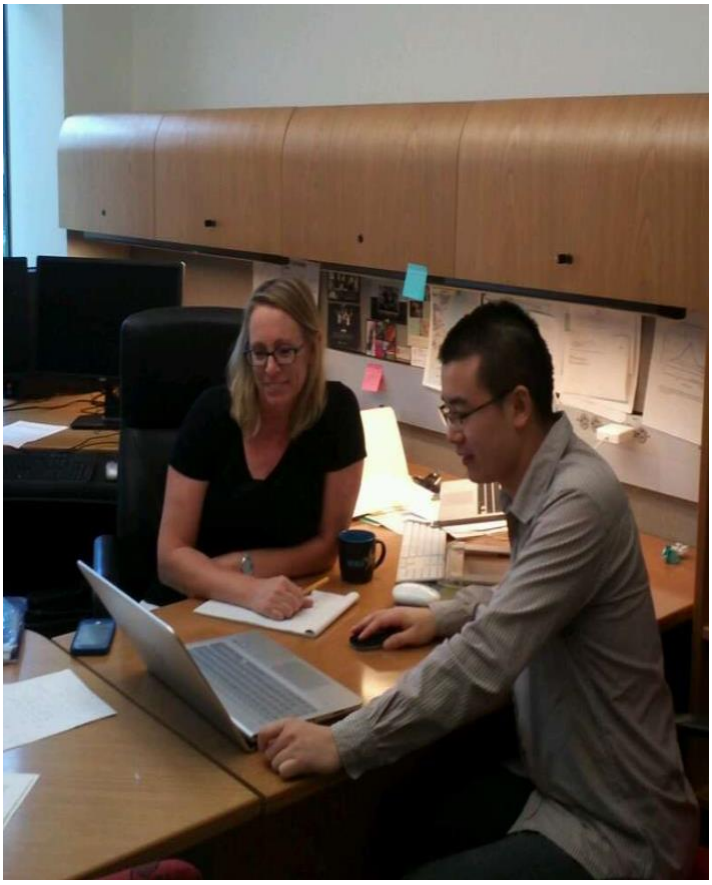
Project Title: PhD in Engineering at an HBCU.

Images for Year 2 Annual Report: 2016 and 2017 Netherlands Research



Project Title: PhD in Engineering at an HBCU.

Images for Year 2 Annual Report: 2016 and 2017 SUMREX Activitie



2016 SUMREX University of Texas

2017 SUMREX University of Central Florida