

PROGRAM PLANNING SUMMARY

Undergraduate Degree Program in Civil and Coastal Engineering Technology

**Coastal Carolina University
College of Science**

**A Cooperative Venture Between
Coastal Carolina University and Horry-Georgetown Technical College**

June 15, 2013
(revised, June 18, 2013)

Signature is available on the original only

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PROGRAM PLANNING SUMMARY

Institution:	Coastal Carolina University
Program Title:	Civil and Coastal Engineering Technology (CCET)
Designation, type, and level of degree:	Bachelor of Science, 4-year undergraduate
Proposed Date of Implementation:	Fall 2014
Fellows/LIFE Scholarship awards:	Yes
CIP Code:	15.9999
Delivery Mode:	Face-to-face and hybrid

I. Program Justification

Need for the Program in the State

The rapidly developing South Carolina coastal zone continues to be an important region of economic and population growth for the State. Coastal hazards such as beach erosion, floods, and hurricanes, as well as global climate change such as sea level rise, can greatly impact this growth and threaten valuable natural resources. Practical engineering solutions to sustain and improve civil infrastructure in light of these imminent threats are increasingly becoming crucial in order to support societal needs.

These solutions require civil engineering skill sets and a keen understanding of complex coastal processes that involve oceanography, geology, and atmospheric science (including chemical and biological aspects). With a strong background in mathematics, science, and engineering, the proposed Civil and Coastal Engineering Technology (CCET) program aims to develop technologists who are adept in the application of the latest civil engineering technology unique to the coastal region.

Relationship of Proposed Program to Existing Programs at Proposing Institution

The College of Science at Coastal Carolina University currently offers undergraduate degrees in Applied Physics (with courses related to environmental physics) and Marine Science (with courses related to the studies of the ocean and atmosphere). The Applied Physics degree complements the existing dual-education engineering program with Clemson University. In Fall 2013, Coastal Carolina University will establish a new school to begin administering the University's first doctoral program in Coastal and Marine Systems Science (CMSS) and oversee the existing Master's program in Coastal Marine and Wetland Studies. Horry-Georgetown Technical College (HGTC) currently offers an associate degree in Civil Engineering Technology.

The proposed program is a *cooperative* venture between the University and HGTC (Conway campus), which are physically located next to one another. Students in the CCET program will complete classes at both institutions. In their third year of study, students can earn an Associate of Applied Science degree in Civil Engineering Technology from HGTC. This proposed program enhances the present HGTC program by leveraging existing and unique science programs at the University (Marine Science, Applied Physics, and CMSS) with courses relevant to the coastal region. Furthermore, the program takes advantage of the growing academic infrastructures and synergistic activities between the two institutions.

Extent to Which Proposed Program Duplicates Existing Programs in State

The proposed CCET program is unique in the state of South Carolina. Undergraduate degrees in "traditional" Civil Engineering are offered at Clemson University, The Citadel, and the University of South Carolina (USC). Both South Carolina State University and Francis Marion University offer a B.S. degree in Engineering Technology. Six technical colleges including HGTC and Florence-Darlington Technical College offer the Associate of Applied Science degree in Civil Engineering Technology. In forming a curriculum in civil engineering technology specialized to the coastal region, this program does not duplicate any programs in the State.

II. Program Demand and Productivity

Enrollment in the proposed program is expected to be sizable during implementation given the number of students enrolled in Fall 2012 in HGTC's Civil Engineering Technology program (60 students) and in the University's existing programs in dual-education engineering, Applied Physics and Marine Science (73, 38, and 813 students, respectively). To sustain and promote this enrollment, program coordinators at the University and HGTC will recruit from approximately 150 talented students annually selected into Horry County's High School Science, Technology, Engineering, and Math (STEM) program. At present, the HGTC's Civil Engineering Technology program permits these students to take related courses at HGTC prior to high school graduation.

Table 1 below outlines the anticipated enrollment based on ten new students each Fall. The first year total headcount is based on 88% returning Fall to Spring and 82% returning Spring to Fall. Years 2-5 headcount is based on an 80% graduation rate. The program aims to have approximately ten graduates annually entering the workforce or pursuing graduate studies after the 4th year.

Table 1: Projected Total Headcount for CCET			
Year	Fall Semester	Spring Semester	Summer Semester
	Total Headcount	Total Headcount	Total Headcount
2014-2015	10	9	NA
2015-2016	17	15	NA
2016-2017	19	17	NA
2017-2018	21	18	NA
2018-2019	21	19	NA

III. Employment Opportunities for Graduates

From 2010 to 2020, the national job outlook for Civil Engineering Technicians is expected to grow by 12% with an increase of more than 19% for Civil Engineers [*U. S. Bureau of Labor Statistics*]. In 2008, engineers held approximately 1.6 million jobs, with the majority being civil engineers. Technical jobs are one of the few fields expected to grow rapidly in the next few years despite the recent economic downturn. The proposed program helps meet this growth demand by offering students opportunities to secure employment and for career advancements. With future societal needs to accommodate global climate change (particularly along the coastal zone) and to seek renewable energy, engineers with scientific knowledge related to the coastal environment will be in demand.

Along with upper-level building block courses in engineering, the proposed curriculum shown below offers a review course for the *Fundamentals of Engineering* (FE) exam to prepare CCET students to become Professional Engineers (after accreditation of the program; see Section V). CCET students will also have the option to apply for the State's Professional Land Surveyor (PLS) license (after accreditation of the program; see Section V). With recent legislation changes, a four-year undergraduate degree is now required for PLS consideration [*SC State Board for Professional Surveyors*]. Currently, only students at South Carolina State University are eligible to apply for the PLS license. From 2010-2020, the statewide job outlook for surveyors is expected to grow by 31%, which is 6% higher than the national projection for the same time period [*CareerOneStop*].

The curriculum also provides a Problem Solving capstone course in which students solve engineering problems posed and sponsored by local and national technology companies. Participating in these activities opens doors for future employment. With curriculum courses above the 400-level included in the new CMSS graduate program, CCET students would have a head start in pursuing master's and Ph.D. degrees in CMSS, should they choose to do so.

IV. Civil and Coastal Engineering Technology Curriculum

The new program will consist of 130-139 credit hours taken at Coastal Carolina University and HGTC (denoted by asterisks*). With emphases on courses relevant to the coastal region *and* the FE review offering, the total credit hours are similar to Civil Engineering (and related) programs in the State. Similar programs offered at Clemson, USC, South Carolina State University, and Francis Marion University require approximately 128-135 credits.

Core Curriculum (34-40 credits): Coastal Carolina University core curriculum will be completed with mandatory courses in:

EGR 275* – Intro. to Computer Aided Design MSCI 111 – Intro. to Marine Science
MATH 160 – Calculus I

Foundation Courses (33 credits)

Engineering Content

ENGR 201 – Engineering Problem Solving
EGR 170* – Construction Materials
EGR 270* – Engineering Computer Applications
EGR 285/95* – Engineering Surveying I/Lab I

Math & Science Content

MATH 161 – Calculus II
MSCI 112 – Origin of the Marine Env.
PHYS 211/12 – Essentials of Physics I/II
PHYS 234 – Statics

Major Requirements (54 credits)

Engineering Content

CET 210* – Strength of Materials
CET 216* – Soil Mechanics
CET 218* – Hydraulics
CET 242* – Concrete Design
CET 246* – Environmental Systems Tech.
CET 251* – Highway Design
CET 245* – Cost Estimating
EGR 286/96* – Engineering Surveying II/Lab II
EGT 252* – Advance Computer Aided Design

Math & Science Content

MSCI 304 – Marine Geology
PHYS 301 – Analytical Mechanics
PHYS 310 – Math Methods in Physics
PHYS 430 – Fluid Mechanics

Integrated Content

CET 252* – Topics in Engineering
ENGR 398 – FE Exam Review
ENGR 499 – Problem Solving Capstone

Three Elective Courses Selected from (9-12 credits)

PHYS 431 – Geophysical Fluid Dynamics MSCI 301 – Physical Oceanography
PHYS 432 – Remote Sensing MSCI 311 – Hydrographic Techniques
PHYS 434 – Atmospheric Physics MSCI 331 – Geographical Info System
MSCI 416 – Hydrogeology MSCI 440 – Applied Coastal Geophys.
MSCI 445 – Coastal Processes Approved Courses at Levels >400

V. Articulation and Inter-institutional Cooperation

In developing this program, the University has worked closely with HGTC in making sure that the listed courses meet the civil engineering standards for future Accreditation Board for Engineering and Technology (ABET) approval. A memorandum of understanding will be established to articulate the sharing of infrastructure and resources, as well as fiscal arrangements.

VI. Estimate of Costs

Since the proposed program is a combination of nearly all existing courses at the two institutions, no new cost to either the University or HGTC will be incurred at implementation. No additional funds for this program are expected from the State. The existing physical plant and equipment resources at both Coastal Carolina University and HGTC are adequate to support the program during the first five years. This existing physical infrastructure includes the University's new Swain Science Building and HGTC's new Engineering Building. HGTC has three full-time faculty members dedicated to its existing Civil Engineering Technology program, while Coastal Carolina University has at least five full-time faculty members in Applied Physics, Marine Science, and CMSS with graduate course work in civil engineering related to the coastal

zone. The existing faculty members are adequate to sustain the program during the first five years.

VII. References

- CareerOneStop (sponsored by US Department of Labor, Employment & Training Admin.)
http://www.careerinfonet.org/occ_rep.asp?optstatus=011000000&soccode=171022&id=1&nodeid=2&stfips=45&search=Go&fullsite=true.
- South Carolina State Board of Registration for Professional Engineers and Land Surveyors,
Document No. 4233, Chapter 49, items 49-201-D-(1).(a).2.b and 49-201-E-(1).(a).2.b
- U. S. Bureau of Labor Statistics, *Occupational Outlook Handbook, 2012-13*, Civil Engineers,
at <http://www.bls.gov/ooh/architecture-and-engineering/civil-engineers.htm>.