

# PROSPECTUS

## Graduate Certificate in Port and Coastal Engineering

The UAA School of Engineering offers a cohesive sequence of courses in the theory and practice of port and coastal engineering. The series is intended to provide specialized education to enhance the theoretical knowledge and practical skills of graduate engineers to deal with engineering problems of the coastal zone. Upon completion of the certificate program, students will have specialized knowledge and skills applicable in all the coastal zones of the world.

### Student Outcomes

Abilities to:

1. characterize oceans, seas, and estuaries in terms of physical dimensions, sediments, water chemistry, major wind patterns and currents, and wave climate,
2. plan and design port and harbor features suited to demands of vessels and cargo transfer operations and to local oceanographic and nearshore conditions,
3. define nearshore coastal processes in terms of wind, wave, and current climates and their interaction with sediments and local features of the shoreline,
4. quantify natural physical processes or human activities responsible for coastal erosion and design shore protection works suited to the local environmental setting, and
5. accomplish oceanographic and engineering data collection, including water level measurements and hydrographic surveys, analyze data, and interpret analytical results to define nearshore bathymetry, waves, tides, and coastal processes.

### Admission Requirements and Related Graduate Certificate Policies

See the beginning of this Chapter for Graduate Certificates University Requirements. Admission to the Port and Coastal Engineering Graduate Certificate Program requires that a student must have earned a Bachelor of Science degree in an engineering discipline from an ABET-accredited institution in the United States or a foreign equivalent.

### Graduation Requirements

See the beginning of this Chapter for Graduate Certificates University Requirements.

### Program Requirements

Complete the following three courses and one of two alternative fourth courses, as noted.

Course Number	Course	Credits
CE A674	Waves, Tides, and Ocean Processes	3
CE A675	Design of Ports and Harbors	3
CE A676	Coastal Engineering	3
CE A677	Coastal Measurements and Analysis , or	
GEO A433	Hydrographic Surveying	<u>3</u>
	Total	12

A student who earns the Port and Coastal Engineering Graduate Certificate may apply up to 9 credits from the Certificate program toward other graduate degrees at UAA.

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**Catalog Copy of Component Course Descriptions**

**Course Title:** CE A674 Waves, Tides, and Ocean Processes for Engineers (3 credits)

**Course Description:** Introduction to the physical properties and behavior of seawater, interactions of seawater with the ocean basins, and the practice of ocean research and engineering. Introduction to the physical properties and behavior of free surface gravity waves, measurements and characterizations of ocean wave climate, and interactions of ocean waves with structures and natural coastal features.

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**Course Title:** CE A675 Design of Ports and Harbors (3 credits)

**Course Description:** Introduction to planning and design of cost-effective port and harbor facilities.

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**Course Title:** CE A676 Coastal Engineering (3 credits)

**Course Description:** Review of deep and shallow water waves, littoral drift, coastal structures, pollution problems, and harbor seiches.

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**Course Title:** CE A677 Coastal Measurements and Analysis (3 credits)

**Course Description:** Review of and practice with modern instrumentation, equipment, sampling and measurement techniques, and methods of analysis for quantitative study of coastal ocean physical processes.

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**Course Title:** GEO A433 Hydrographic Surveying (3 credits)

**Course Description:** The course provides students with knowledge of and skills to apply physical principles, instrumentation, data analysis methods, and visualization products associated with hydrographic surveying, chart publication, and related marine measurement practices of government and industry.

**Table 2 - Four-year offering plan**

Course	credits	2006			2007			2008			2009		
		Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer
CE A674	3	ADJ			ADJ			ADJ			ADJ		
CE A675	3	Smith + ADJ			Smith + ADJ			Smith + ADJ			Smith + ADJ		
CE A676	3		Smith			Smith			Smith			Smith	
CE A677	3		ADJ			ADJ			ADJ			ADJ	
GEO A433	3	ADJ			ADJ			ADJ			ADJ		

**Four-year budget**

**Fiscal plan for development and implementation**

The proposed Graduate Certificate in Port and Coastal Engineering is composed of courses that have been offered by the UAA School of Engineering for 8 years. These courses will continue to be taught as they have been as popular electives toward Master of Science degrees in Civil and Arctic Engineering and as undergraduate technical electives toward a BS in Civil Engineering. No additional financial resources are required to develop or implement the program. Qualified faculty members are available to present the course materials and suitable equipment, instruments and other facilities are on hand. Table 1 summarizes financial predictions for the program. Expenses include the proportionate cost for full-time faculty and contract costs for Adjunct who will be contributing to this program. Revenues are primarily tuition for an anticipated average enrollment of 10 students per course. Current funding will continue to support their efforts and additional revenues from tuition increases will allow more varied experiences for students.

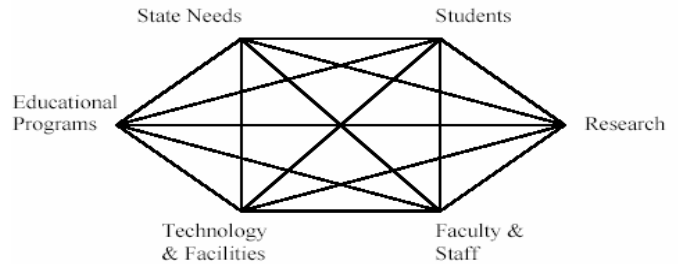
**Table 1 – Expense and Revenue Projections**

	FY07	FY08	FY09	FY10
1 Full-time Engineering faculty (20%)	17,100	17,100	17,100	17,100
3 Part-time Adjunct faculty	18,800	18,800	18,800	18,800
<b>Estimated Tuition Revenue for Program</b>	<b>\$36,200</b>	<b>\$36,200</b>	<b>\$36,200</b>	<b>\$36,200</b>
<b>Net Program Revenue</b>	<b>\$300</b>	<b>\$300</b>	<b>\$300</b>	<b>\$300</b>

## University of Alaska Board of Regents

### Board of Regents Summary Form

University of Alaska Anchorage  
School of Engineering



## Graduate Certificate in Port and Coastal Engineering

### Title and brief description

The School of Engineering (SOE) proposes to offer a Graduate Certificate in Port and Coastal Engineering in response to an increasingly recognized need for specialized knowledge and skill among engineers who attend to problems and design infrastructure on the shores of Alaska. Graduate engineers will earn this credential by completing a cohesive sequence of courses in the theory and practice of port and coastal engineering. The series is intended to enhance the theoretical knowledge and practical skills of graduate engineers to appropriately deal with engineering challenges of the coastal zone. Upon completion of the certificate program, students will have specialized knowledge and skills applicable in all the coasts and oceans of the world.

### Target admission date Fall 2006

### Relation to the Academic Mission of the University of Alaska Anchorage

The University of Alaska Anchorage is located on the shore of Cook Inlet and is surrounded by the State's most densely populated and commercially developed coastal communities. The region occupied by UAA's main and community campuses includes the State's largest ports and largest recreational and commercial fishing harbors. The UAA School of Engineering is advantageously situated to provide specialized continuing education for Alaska's professional engineering community whose offices are concentrated in Anchorage. This professional community faces a growing call for expert assistance from communities troubled by coastal erosion and shoreline development issues associated with expanding population and commercial development along the coast. The proposed Graduate Certificate will provide engineers with a professional qualification that will help them assure public safety and protection of public and private investments along Alaska's coastline. The credential will make commercial engineers qualified and competitive for work in other coastal regions of the world.

### State Needs met by this program

Alaska's harbors and seaports are primary centers of commerce and vital links to interior communities and to valuable natural resources. The scenic grandeur of the State's 33,000-mile shoreline draws visitors from around the globe. Coastal resources must be shepherded by sophisticated means to assure their sustainability. Specialized training is necessary to design, build, and operate coastal works in cold regions and to evaluate their effects on land and marine environments. Owners of the proposed Port and Coastal Engineering Graduate Certificate will carry formal university acknowledgement of their particular expertise. It is the intent of the UAA School of Engineering that the certificate becomes a standard qualification for those who regularly practice port and coastal engineering in Alaska.

### State Needs are not met by the existing programs

Courses included in the proposed Graduate Certificate program have been taught by the UAA School of Engineering for 8 years as elective components of Master of Science degrees in Civil or Arctic Engineering. The training has led those who completed the courses to become

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highly competitive commercial engineers and valued agency specialists addressing coastal issues in Alaska and elsewhere. A distinct credential is not yet provided in the UA system that recognizes professional qualification in this highly specialized area of engineering practice.

**Program Planning**

The program of course offerings has existed for 8 years, with the exception of CE A677 Coastal Measurements, which began on a trial basis in 2003. Highly qualified instructors are on hand as full-time faculty or as Adjunct Professors who are Anchorage residents. Course materials are continually refined to stay abreast of research findings and of state-of-the-art in engineering practice. A bureau of highly qualified guest lecturers is cultivated and employed to enhance all the courses in the program. New media and teaching methods are incorporated as they become available after instructors have been trained in their application. Students applying for admission to the certificate program will be guided to its conclusion by careful School of Engineering administration of their academic progress. As indicated in the attached four-year schedule, the full set of certificate courses will be repeated each academic year, as in the following table.

Course	credits	2006		2007		2008		2009	
		Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
CE A674	3		ADJ		ADJ		ADJ		ADJ
CE A675	3		Smith + ADJ		Smith + ADJ		Smith + ADJ		Smith + ADJ
CE A676	3	Smith		Smith		Smith		Smith	
CE A677	3	ADJ		ADJ		ADJ		ADJ	
GEO A433	3		ADJ		ADJ		ADJ		ADJ

**UAA School of Engineering Advisory Board input**

The Advisory Board was briefed on the intent to submit the Port and Coastal Engineering Graduate Certificate program for approval, most recently at its 21 April 2006 meeting. The Board voiced its approval for graduate certificates as University-granted credentials separate from MS and PhD degrees and for this proposed certificate program, in particular. The Board has favored all forms of professional development for the engineering community, which is so concentrated in the Anchorage area.

**Student opportunities**

The Graduate Certificate in Port and Coastal Engineering is designed for students employed or seeking employment as practicing professionals in the academic, regulatory, industrial, military, or consulting sectors. Certificate requirements include courses involving direct engagement with communities and regional governments for the sake of providing real-world experience in facing complex issues and challenges of coastal development. Practical challenges are posed to students who collaborate as working groups to formulate optimum solutions. Certificate owners will be sought-after commercial engineers and valued agency specialists addressing coastal issues in Alaska and elsewhere.

**Student outcomes**

Abilities to:

1. characterize oceans, seas, and estuaries in terms of physical dimensions, sediments, water chemistry, major wind patterns and currents, and wave climate,
2. plan and design port and harbor features suited to demands of vessels and cargo transfer operations and to local oceanographic and nearshore conditions,

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3. define nearshore coastal processes in terms of wind, wave, and current climates and their interaction with sediments and local features of the shoreline,
4. quantify natural physical processes or human activities responsible for coastal erosion and design shore protection works suited to the local environmental setting, and
5. accomplish oceanographic and engineering data collection, including water level measurements and hydrographic surveys, analyze data, and interpret analytical results to define nearshore bathymetry, waves, tides, and coastal processes.

**Outcomes Assessment Plan:** Successful achievement of these outcomes will be assessed by evaluation of homework assignments, quizzes, examinations, and individual and group reports submitted by students as part of the courses that compose the certificate program.

**Enrollment Projections**

Historical enrollments in the courses composing the proposed Graduate Certificate are presented below. The availability of the certificate is expected to increase these enrollments to a stable average enrollment of 10 students in each class. An average 10 certificates per year are projected to be awarded after the second year the certificate is officially available.

Year	1997		1998		1999		2000		2001		2002		2003		2004		2005		2006	
Course	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	
CE A674			6					6			9									1
CE A675	10				15				11				8			14		7		8
CE A676		5				5					10		4							6
CE A677											6		2				6			7
GEO A433				9		7					6				10		5			3

**Student Services**

Student services available at the department and the institutional levels are available for all admitted students, including:

- Departmental services of academic and career advising, research arrangements, laboratory support, information technology support, peer mentoring, and internship placements.
- Institutional services include admissions, testing, transfer evaluations, financial aid, housing, student organizations and governance.

Projected increases in participation in this program are not expected to impact the availability or quality of those services.

**Faculty and Staff**

Courses required for the Graduate Certificate have been and will be taught by:

CE A674 Waves, Tides, and Ocean Processes	Adj. Prof. Jack Colonell, PE, PhD.
CE A675 Design of Ports and Harbors	Adj. Prof. Harvey Smith, PE + Prof. Orson Smith, PE, Ph.D.
CE A676 Coastal Engineering	Prof. Orson Smith, PE, Ph.D.
CE A677 Coastal Measurements and Analysis	Adj. Prof. Robert Pawlowski (Captain, NOAA, ret.)
GEO A433 Hydrographic Surveying	Adj. Prof. Robert Pawlowski (Captain, NOAA, ret.)

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**Orson P. Smith, PE, Ph.D.**, Professor and Chair of Civil Engineering: Orson Smith joined the Alaska District, Corps of Engineers in 1973 and became Chief of Navigation and Flood Control Branch in 1975 and Chief of Coastal Planning in 1981. Orson left Alaska in 1983 to join the Coastal Engineering Research Center in Vicksburg, MS. He left the Corps in 1986 for his doctoral studies, but returned to the Alaska District in 1991 as manager of port and coastal feasibility studies. He joined the UAA School of Engineering faculty in 1998, where he had been an Adjunct Professor since 1992 teaching coastal engineering. He has continued teaching water and coastal engineering courses at UAA and has performed related research. Orson earned a BS in Mechanical Engineering from the University of Kentucky in 1971, a graduate diploma in coastal engineering at Delft in the Netherlands in 1979, an MS in Civil Engineering at Mississippi State in 1986, and a PhD in physical oceanography at North Carolina State in 1989. He has been a registered Professional Engineer in the State of Alaska since 1983.

**Robert Pawlowski** (Captain, NOAA, ret., NMI), Adjunct Professor: Bob Pawlowski retired from the NOAA commissioned Corps after 26 ½ years service and holds a US Coast Guard Masters License. He is currently Executive Director of the Alaska Fisheries Development Council and was previously General Manager of St. George Chadux Corp., Alaska Program Manager for Thalys Geosolutions and Port Advisor for Port MacKenzie. He has a BS in Biological Science (Cal Poly 1972), an MS in Engineering Management (UAA 1999), and an MBA (UAA 2003). He has been instructor of GEO A433 Hydrographic Surveying since 1998 and of CE A677 Coastal Measurements and Analysis since 2003.

**Joseph M. Colonell, PE, Ph.D.**, Adjunct Professor: Principal Engineer/Oceanographer, URS Corp., Alaska. Dr. Colonell has nearly four decades of experience as a professional engineer and oceanographer. Before joining URS in 1980, Colonell was Professor of civil and ocean engineering at Univ. of Massachusetts - Amherst and of marine science at Univ. of Alaska Fairbanks. In addition to his academic credentials in research, teaching and scholarship, Colonell has achieved recognition in his consulting career as an expert in development of practical engineering solutions that minimize environmental impacts of developments in coastal regions. His degrees include: Stanford University: PhD, Civil Eng & Applied Math. 1966, Washington State Univ.: M.S., Civil Eng & Applied Math., 1962, Delft Technical University (Netherlands): Fulbright Scholar, Coastal Eng. Studies, 1960-61, Univ. of Colorado: B.S., Civil Eng, 1958. He is a registered Professional Engineer in Alaska, California, Massachusetts, and Washington.

**Harvey Smith, PE**, Adjunct Professor, Statewide Coastal Engineer, Alaska Dept. Transportation & Public Facilities since 1981. BS and MS Civil Engineering, Univ. Washington

Program Administration: Professor Orson Smith, PE, Ph.D., Chair, Dept. of Civil Engineering

**Impacts on existing Technology & Facilities**

The certificate program will be delivered on the main UAA campus using existing classrooms, laboratories, and equipment. No new facilities will be required for the program.

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**Library and Information Systems**

All UAA students have access to the full suite of library services, many of which are available on line (see: <http://www.lib.uaa.alaska.edu/>). Engineering graduate students have access to publications on research and practice through Ingenta Connect and other journal abstract services through the UAA Consortium Library. Copies of journal articles not on library shelves are available within a few days as email attachments through Interlibrary Loan Service.

**Research opportunities**

Students pursuing the Graduate Certificate may be inspired to continue their education and participate in research toward a Master of Science in Civil Engineering or in Arctic Engineering. The UAA School of Engineering has active research in coastal erosion and other nearshore processes involving use of specialized equipment owned by the School including a 22-foot trailerable research vessel, a hydrographic survey system, an acoustic Doppler current profiler, a directional wave gauge, a sea water property profiler, water and bed sediment samplers, sea ice core extractors, and a range of associated apparatus, equipment, and data analysis software. Approximately \$½ million of surveying equipment has been donated to UAA by the Trimble Navigation Corporation, much of which is applicable to port and coastal engineering applications.

**Technology needs**

As indicated above, the UAA School of Engineering has equipped itself over the course of time to have on hand a useful set of coastal engineering instruments and equipment. This present technology is sufficient for presentation of the courses included in the proposed program. The School must maintain its existing equipment and must seek means to purchase new equipment as methods in this specialized industry change. The present UAA boat, with pilot and instructor aboard, is suitable for only 3 students at a time. A larger boat and better facilities on campus for its storage and maintenance would improve student opportunities for valuable hands-on field experience, as well as make a more capable and versatile research platform.