



UNIVERSITY OF ALASKA ANCHORAGE

Office of Academic Affairs  
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December 1, 2008

To: Dr. Dan Julius, Vice President Academic Affairs and Research  
UA Systemwide Academic Council

From: Mike Driscoll, UAA Provost

Subject: New graduate certificate program in the UAA School of Engineering

The UAA School of Engineering (SOE) has developed two new graduate certificate programs: One program in Environmental Regulations and Permitting and the other in Earthquake Engineering. Both of these programs have been designed to meet the state mandated continuing education requirements of the engineering profession as well as to address key areas requiring focused training. Both certificates have been endorsed by the UAA Engineering Advisory Board and approved through the normal governance process.

#### Environmental Regulations and Permitting

The Environmental Regulations and Permitting certificate was designed by the faculty in the Applied Environmental Science & Technology (AEST) program to provide specialized training that enhances the knowledge and practical understanding of professionals in dealing with environmental regulations and the permitting process. Input to the program design was solicited from practicing professionals.

Three of the four courses required for this certificate are already available at UAA and there is sufficient capacity in the required courses to support the anticipated additional students. A fourth course, a capstone course, is being introduced to tie together the concepts presented in the other three courses using project work. The School of Engineering has committed to regular offerings, through fund reallocations if needed.

#### Earthquake Engineering

The Earthquake Engineering certificate program was designed by the civil engineering faculty to provide specialized training that will help design professionals to create safer structures.

The courses for this program already exist within the civil engineering graduate curriculum and there is sufficient capacity in the required courses to support the anticipated additional students.

The implementation of these certificate programs will encourage students to engage in these structured academic programs to build their professional skills. Students will receive recognition from the University for their academic accomplishments and be prepared for special certifications. We ask that you add your approval to these certificates and forward them to the Board of Regents.



# PROSPECTUS

## Graduate Certificate in Environmental Regulations and Permitting

### **University of Alaska Board of Regents Program Approval Summary Form**

**MAU:** University of Alaska Anchorage

**Title:** Graduate Certificate in Environmental Regulations and Permitting

#### **Title and Brief Description**

The UAA Applied Environmental Science & Technology Program offers a cohesive sequence of courses in key federal environmental laws and regulations and federal and state environmental permitting. The series is intended to provide specialized education to enhance the knowledge and practical understanding of environmental professionals who deal with challenges in environmental regulations and permitting required for development projects or similar activities. Upon completion of the certificate program, students will have specialized knowledge and skills applicable to Alaska and other areas in the United States.

**Target Admission Date** Fall 2009

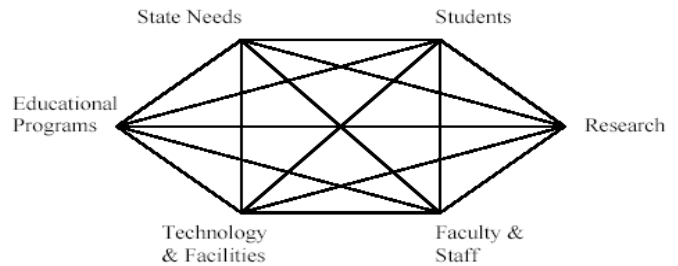
#### **Relation to the Education Mission of the University of Alaska and the MAU**

The mission of both the University of Alaska and UAA involves discovery and dissemination of knowledge. This new program contributes to the mission by disseminating knowledge to the practicing environmental community of Alaska concerning the latest research and design standards requirements related to environmental regulations and permitting.

Development within the State of Alaska, as in other areas of the United States requires knowledgeable environmental professionals who understand federal and state laws and regulations and the many permitting requirements that exist. University of Alaska Anchorage is located near the majority of environmental professionals in the state who work with environmental regulations and permitting. This means UAA School of Engineering is advantageously situated to provide specialized continuing education for Alaska's professional environmental consulting firms and industry whose offices are concentrated in Anchorage. This area of the State is also the location of the major federal and state environmental agencies offices. The environmental professional community faces a growing call for expert assistance in navigating through the environmental regulations and permitting requirements. The proposed graduate certificate will provide environmental professionals with relevant experience and exposure to ensure understanding and proper application of environmental law to the permitting process.

#### **Promotion and Development of the program**

The proposed certificate program was conceived by the environmental faculty of the civil engineering department as a means to improve the visibility of the AEST program and to provide recognized certification for professionals that need the training in environmental regulations and permitting. The responsible faculty then surveyed students, industry, and government professionals at the Alaska Forum on the Environment in 2007 concerning the need for the certificate and received positive response concerning the proposed program.



## PROSPECTUS

### Graduate Certificate in Environmental Regulations and Permitting

The UAA School of Engineering Advisory Board was briefed on the intent to submit the Environmental Regulation and Permitting Graduate Certificate program for approval, most recently at its 21 April 2007 meeting. The Board voiced its approval for graduate certificates as University-granted credentials separate from M.S. and Ph.D. degrees and for this proposed certificate program, in particular. The Board has favored all forms of professional development for the engineering community.

#### **State Needs met by this program**

A graduate certificate program that focuses on environmental permitting, laws, and regulations would fill a growing need for professionals with knowledge of these key subjects. The National Environmental Policy Act (NEPA) is the backbone policy applied to all projects receiving federal funding or subject to federal permits. A course on the fundamentals of NEPA with an emphasis on project-level implementation would implant knowledge of arguably the most important environmental law in the U.S. Second, experience with the Clean Water Act (CWA) is integral to environmental work in Alaska. Approximately 43 percent of Alaska's landmass is covered by wetlands and massive volumes of surface water flow through the state; rarely is a project proposed that will not be subject to the CWA. Third, a working knowledge of permitting processes, regulations, and laws in addition to the CWA and NEPA would provide a balanced perspective of U.S. and Alaska state environmental regulatory frameworks. Finally, a capstone course that encapsulates knowledge gained in other classes and stresses compliance and permitting processes on a project- or industry-specific basis would prepare students for real world environmental work.

Environmental regulations and permitting ensure the balanced development for Alaska's long term sustainability. Specialized training is necessary to understand and apply environmental regulations and permitting to activities within the State of Alaska and the rest of the United States. Owners of the proposed Environmental Regulation and Permitting Graduate Certificate will carry formal university acknowledgement of their particular expertise. It is the intent of the UAA Applied Environmental Science and Technology Program that the certificate becomes a standard qualification for those who wish to practice environmental permitting in Alaska.

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

This program meets an identified need not already addressed by the existing AEST program. This is accomplished by the addition of a fourth course, *Environmental Permitting Project*. This course is designed to give students, who are proficient with key environmental laws such as NEPA & CWA, an opportunity to apply these laws and relevant regulations to current or proposed science and engineering projects. The proposed methodology will require that students interact with the professional community as they learn about and navigate the system. In doing so, students are required to evaluate the proposed project with special emphasis on the environmental impact and community interest.

#### **Student opportunities**

The Graduate Certificate in Environmental Regulations and Permitting 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. This demonstrates the complex issues and challenges imposed on science and engineering projects by environmental regulation and permitting. Practical challenges are posed to students who collaborate as working groups to formulate solutions. Certificate owners

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## Graduate Certificate in Environmental Regulations and Permitting

will be sought-after environmental regulatory and permitting specialists addressing environmental issues in Alaska and elsewhere.

### Student outcomes

Students will be able to:

1. apply the principles and requirements of major federal environmental laws and regulations, including the National Environmental Policy Act (NEPA) and the Clean Water Act (CWA), and State laws and regulations to projects, policy changes and other applicable activities,
2. synthesize practical challenges facing applicants, policy makers, agency personnel and the public in working with Federal and State laws and regulations,
3. understand the environmental data needs and data management options associated with Federal and State permitting requirements for proposed development projects,
4. specify NEPA, CWA and other state and federal permitting requirements for Alaska based projects,
5. understand and anticipate the positions and interests of various Alaska stakeholders (including government policy makers, agency personnel, industry, municipalities, non-governmental organizations and the general public) to facilitate conflict resolution potentially encountered during the regulatory and permitting process.

**Outcomes Assessment Plan:** Successful achievement of each of these outcomes will be assessed by evaluation of homework assignments, 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 in Table 1. 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.

**Table 1: Historical Enrollment**

Year	2005		2006		2007		2008	
Course	F	S	F	S	F	S	F	S
AEST A604 or EQE A694E	7				8			
AEST A605 AEST or EQE A694J	7		10					
AEST A606 AEST or EQE A694L		5		8		6		6

### 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, Arctic Engineering, Engineering, Science or Project Management or Applied Environmental Science & Technology. The UAA School of Engineering has active research in water quality, wastewater treatment, geotechnical engineering, coastal erosion and other nearshore processes. Most of the current research involves the use of equipment currently owned by SOE including water and wastewater test kits, 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

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## Graduate Certificate in Environmental Regulations and Permitting

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 Environmental Regulations and Permitting.

### **Fiscal plan for development and implementation**

The proposed Graduate Certificate in Environmental Regulations and Permitting is composed of three courses that have been offered by the UAA Applied Environmental Science and Technology Program for 2 years plus one new course. The existing courses will continue to be taught as they have been popular electives toward Master of Science degrees in the Applied Environmental Science & Technology program. The new course will be taught by reassignment of one existing faculty member. Qualified faculty members are available to present the course materials and suitable equipment, instruments and other facilities are on hand. No additional financial resources are required to develop or implement the program.

Table 2 summarizes financial predictions for the certificate program. As three of the four courses in the certificate program are existing courses and use existing resources, Table 1 only considers the incremental expenses and revenue generated by the new certificate program. A 3% increase in both faculty expense and tuition revenue is assumed.

**Table 2: Incremental Expenses and Revenue**

	<b>FY 10</b>	<b>FY 11</b>	<b>FY 12</b>	<b>FY13</b>
<b>Program Expense</b>				
Reassignment of one full time faculty to teach one course	\$ 13,000	\$ 13,390	\$ 13,792	\$ 14,205
<b>Total Expense</b>	\$ 13,000	\$ 13,390	\$ 13,792	\$ 14,205
<b>Program Revenue</b>	(FY 10 Tuition rate = \$316/credit)			
Increases in existing courses *	\$ 5,688	\$ 5,859	\$ 6,034	\$ 6,215
Tuition in new course **	\$ 9,480	\$ 9,764	\$ 10,057	\$ 10,359
<b>Total Revenue</b>	\$ 15,168	\$ 15,623	\$ 16,092	\$ 16,574
<b>Total Balance</b>	<b>\$ 2,168</b>	<b>\$ 2,233</b>	<b>\$ 2,300</b>	<b>\$ 2,369</b>

\* Assumes two additional students in each of the three existing courses.

\*\* Assumes ten students enrolled in the new course.

### **Impact on Faculty & Staff**

Administration of the program will be done by the civil engineering department. Faculty resources exist and can be assigned according to School priorities.

### **Impact on Student Services**

This program caters to part-time students engaged in professional practice. It is not anticipated that the growth of this program will have a significant impact on the student services resources of the institution.

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## Graduate Certificate in Environmental Regulations and Permitting

### **Impact on 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://consortium/library.org>). 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. It is expected that this program will increase the use of available library resources.

### **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.

### **Program Planning**

The program course offerings have existed for 3 years, with the exception of AEST A607. AEST A607 is proposed to complete this certificate program. 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 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 and accepted into the certificate program will be guided to its conclusion by Applied Environmental Science and Technology Program administration. As indicated in the four-year schedule (Table 3), the full set of certificate courses will be repeated each academic year, as in the following table.

**Table 3:** Four-year Course Offering Plan

Course	credits	2008		2009		2010		2011	
		Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
AEST A604	3	Adjunct		Adjunct		Adjunct		Adjunct	
AEST A605	3	Adjunct		Adjunct		Adjunct		Adjunct	
AEST A606	3		Adjunct		Adjunct		Adjunct		Adjunct
AEST A607	3	McDonald		McDonald		McDonald		McDonald	

### **Faculty and Staff**

The following faculty are available to teach these course and will be assigned through normal school scheduling policies:

AEST A604	Environmental Law, Regulations and Permitting	Adj. Prof. Robert Reges J.D.
AEST A605	National Environmental Policy Act	Adj. Prof. Alice Bullington
AEST A606	Clean Water Act	Adj. Prof. Alice Bullington
AEST A607	Environmental Permitting Project	Assist. Prof. Nyrée McDonald, Ph.D.

**Robert Reges, J.D., Adjunct Professor;** Robert is a well respected Alaska attorney who has recently relocated from Juneau to Anchorage. He is a member of Amodio Reeves LLC. and provides assistance on environmental matters to Hartig Rhodes Hoge & Lekisch P.C. in an “of

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### Graduate Certificate in Environmental Regulations and Permitting

counsel” capacity. For seven years Robert was an Assistant Attorney General in the Juneau office of the Alaska Department of Law, representing the resource departments. He worked on many matters involving state and federal environmental laws, and he has worked with Alaska Department of Environmental Conservation (ADEC) and Environmental Protection Agency (EPA) on enforcement issues. He is the co-author of the Alaska Clean Air Act, the primary author of Alaska’s commercial passenger vessel statutes, and contributing author on the corollary regulations. He has been in private practice since 1997 and has expanded his environmental focus into all matters involving land use.

His is a litigation-honed knowledge of environmental issues and he brings a hybridized perspective that compiles the concerns of government regulators, the regulated community, and citizen oversight on all matters involving air, land or water.

**Alice Bullington, M.S.** , Adjunct Professor: Sr. Project Management Risk Assessment Specialist, ConocoPhillips Alaska Inc. (CPAI). Ms. Bullington has over 20 years of experience as an environmental scientist. Ms. Bullington has been the lead environmental permitter for new and existing North Slope and Cook Inlet development projects. She has extensive experience in the Environmental Impact Statement (EIS) process and National Pollutant Discharge Elimination System (NPDES) permitting as well as other federal and state permitting processes. Prior to working for the oil industry in 1989, Ms. Bullington worked for the Kenai Peninsula Borough. Her degrees include a M.S. in Environmental Quality Science (1987) and B.S. in Geology both from the University of Alaska Fairbanks.

**Nyree McDonald, Ph.D.:** Assistant Professor of Civil Engineering and the Director of the Applied Environmental Science and Technology Program at UAA. She has been a part of the UAA SOE faculty since August of 2005 and she has taught courses in both graduate and undergraduate programs. Her research has focused on drinking water treatment. She holds a B.S. in Chemical Engineering from Tuskegee University, a M.S. in Environmental Quality Engineering from the University of Alaska Anchorage, and a M.S. and Ph.D. in Chemical Engineering from the University of Notre Dame.

**PROSPECTUS**  
**Graduate Certificate in Environmental Regulations and Permitting**  
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**Graduate Certificate in Environmental Regulations and Permitting**

The UAA Applied Environmental Science & Technology (AEST) Program offers a cohesive sequence of courses in key federal environmental laws and regulations and federal and state environmental permitting. The series is intended to provide specialized education to enhance the knowledge and practical understanding of environmental regulations and the permitting process. Upon completion of the certificate program, students will have specialized knowledge and skills applicable to Alaska and other areas in the United States.

**Student Outcomes**

Students will be able to:

1. apply the principles and requirements of major federal environmental laws and regulations, including the National Environmental Policy Act (NEPA) and the Clean Water Act (CWA), and State laws and regulations to projects, policy changes and other applicable activities,
2. synthesize practical challenges facing applicants, policy makers, agency personnel and the public in working with Federal and State laws and regulations,
3. understand the environmental data needs and data management options associated with Federal and State permitting requirements for proposed development projects,
4. specify NEPA, CWA and other state and federal permitting requirements for Alaska based projects,
5. understand and anticipate the positions and interests of various Alaska stakeholders (including government policy makers, agency personnel, industry, municipalities, non-governmental organizations and the general public) to facilitate conflict resolution potentially encountered during the regulatory and permitting process.

**Admission Requirements and Related Graduate Certificate Policies**

See the beginning of this Chapter for Graduate Certificates University Admissions Requirements. Admission to the Environmental Regulations and Permitting Graduate Certificate Program requires that a student must have earned a Bachelor of Science degree in a science or engineering discipline from an accredited institution in the United States or a foreign equivalent.

**Graduation Requirements**

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

**Program Requirements**

Students must complete the first three courses before they may enroll in the Environmental Permitting Project (AEST A607) course.

<b>Course Number</b>	<b>Course</b>	<b>Credits</b>
AEST A604	Environmental Law, Regulations and Permitting	3
AEST A605	National Environmental Policy Act	3
AEST A606	Clean Water Act	3
AEST A607	Environmental Permitting Project	<u>3</u>
	Total	12

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Graduate Certificate in Environmental Regulations and Permitting

A student who earns Environmental Regulations and Permitting Graduate Certificate may apply up to 9 credits from the Certificate program toward other graduate degrees at UAA.

**Catalog Copy of Component Course Descriptions**

**Course Title:** AEST A604 Environmental Law, Regulations and Permitting (3 credits)

**Course Description:** Introductory graduate level course on understanding and navigating environmental laws and regulations. Students will learn the principles of major environmental laws in the U.S., practice interpreting regulations and prepare permits.

**Prerequisite:** N/A

**Registration restrictions:** Bachelor of Science degree in a science or engineering discipline.

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**Course Title:** AEST A605 National Environmental Policy Act (3 credits)

**Course Description:** Examines the National Environmental Policy Act (NEPA) requirements including process, roles and responsibilities of involved parties, impact analysis, alternative development, stakeholder involvement and environmental conflict resolution. Subject matter experts from State and Federal agencies, industry, environmental nongovernmental organizations and utilities will provide their perspectives on NEPA.

**Prerequisite:** N/A

**Registration restrictions:** Bachelor of Science degree in a science or engineering discipline.

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**Course Title:** AEST A606 Clean Water Act (3 credits)

**Course Description:** Examines the Clean Water Act and its impact on the environment. The course will explore the history of the Act, and various programs established by the Act including the Section 404 wetlands program and the National Pollutant Discharge Elimination System (NPDES) pollution control program. Subject matter experts from State and Federal agencies, industry, environmental nongovernmental organizations and utilities will provide their perspectives on the Clean Water Act and its effectiveness.

**Prerequisite:** N/A

**Registration Restrictions:** Bachelor of Science degree in a science or engineering discipline.

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**Course Title:** AEST A607 Environmental Permitting Project (3 credits)

**Course Description:** Explores the complex relationship between environmental regulatory and permitting requirements and their application to engineering and science projects.

**Prerequisite:** [AEST A604, AEST A605 and AEST A606] with a grade of “B” or better.

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Graduate Certificate in Environmental Regulations and Permitting

**Registration Restrictions:** Admission to Applied Environmental Science and Technology graduate program.

PROSPECTUS  
Graduate Certificate in Environmental Regulations and Permitting

PROSPECTUS  
Graduate Certificate in Earthquake Engineering

**University of Alaska Board of Regents  
Program Approval Summary Form**

**MAU:** University of Alaska Anchorage

**Title: Graduate Certificate in Earthquake  
Engineering**

**Brief Description**

The UAA School of Engineering proposes to offer a cohesive sequence of courses leading to a graduate certificate in Earthquake Engineering. The certificate course is intended to provide specialized training and practical understanding of core issues governing the earthquake-resistant design of structures. The course will focus on evaluation of ground motion characteristics, soil-structure interactions, structural response analysis and structural design to provide students and practising engineers specialized knowledge and skills applicable for design of earthquake-resistant structures in Alaska and other seismically active areas of the world.

**Target Admission Date Fall 2009**

**Relation to an Education Mission of the University of Alaska and the MAU**

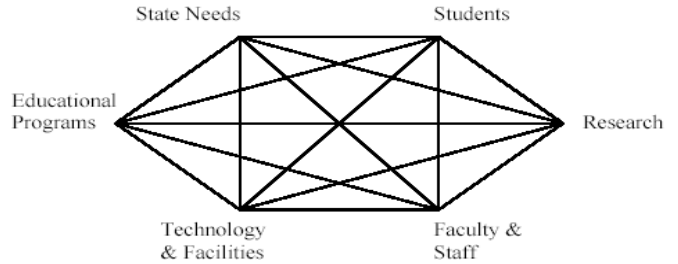
The mission of both the University of Alaska and UAA involves discovery and dissemination of knowledge. This new program contributes to the mission by disseminating knowledge to the practicing engineering community of Alaska concerning the latest research and design standards requirements related to earthquake engineering.

Alaska is earthquake country. Almost the entire State of Alaska is located on one of the world's most highly active seismic zones as illustrated in seismic hazard maps of the United States. These maps clearly demonstrate a high probability of future occurrence of strong earthquakes in this region. The overall effects of catastrophic events, such as experienced during the Prince William Sound earthquake (Magnitude 9.2) in 1964, are highly destructive. With the rapid growth and development of Anchorage and its surrounding areas in terms of population, lifeline networks, transportation systems, and high-rise buildings, seismic risk to life and property has substantially increased since the 1960's. The University of Alaska Anchorage, School of Engineering is a center of experienced professionals who are working actively on various aspects of earthquake related engineering problems. The UAA campus is advantageously situated to provide specialized education to Alaska's professional engineers associated with the construction industries in and around Anchorage and across the State. The U. S. Geological Survey, in collaboration with the University of Alaska, has established a state-of-the-art seismic network consisting of ground, boreholes and structural sensors in Anchorage area. The proposed Graduate Certificate will provide the practicing engineers a professional qualification that will acknowledge specialized earthquake-resistant design of structures. The credential will make the engineers more qualified and competitive in undertaking challenging engineering tasks for active seismic zones of the United States and elsewhere.

**Promotion and Development of the program**

The earthquake engineering program was conceived by the faculty of the civil engineering program in response to observations by students and practitioners regarding the need for focused attention on earthquake engineering issues in the high seismic regions surrounding the northern pacific rim.

In developing the program, the faculty considered the current state of the art and the essential components of earthquake engineering necessary for successful design of earthquake resistant structures. These components are logical parts of the existing Masters degrees, however a need was identified for certified training for engineers not desiring to pursue a graduate degree.



## PROSPECTUS

### Graduate Certificate in Earthquake Engineering

The UAA School of Engineering Advisory Board was briefed on the intent to submit the Graduate Certificate program on earthquake engineering for approval, most recently at its 14 February, 2008 meeting. The Board voiced its approval for graduate certificates as University-granted credentials separate from M.S. and Ph.D. degrees and for this proposed certificate program, in particular. The Board has favored all forms of professional development for the Alaska engineering community, which is concentrated in the Anchorage area.

#### **State Needs met by this program**

The Federal Emergency Management Agency estimates that with the present infrastructure and policies, Alaska will have the second highest average annualized earthquake-loss ratio (ratio of average annual losses to infrastructure) in the country. Reducing those losses requires public commitment to earthquake-conscious site selection, design, and construction of infrastructure. Proper measures for earthquake-risk mitigation could prevent loss of hundreds of millions of dollars and significantly reduce injuries and casualties. The Alaska Seismic Hazards Safety Commission has recommended proper assessment of structural stability of critical facilities in the state and adequate seismic risk mitigation for future building construction. The proposed graduate certificate aims to educate engineers to accomplish proper seismic designs that address the effects of ground failure, ground shaking amplification, and structural response. The program aims for a sustainable development of the state by incorporating proper disaster resilience and mitigation planning for preventing economic losses and human casualties.

Additionally, the courses in this program can be used by practicing engineering to meet the State mandated licensure continuing education requirements.

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

The existing undergraduate and graduate degree programs in civil engineering are broad in scope with limited capacity to emphasize the earthquake aspects of structural design that are of prime local importance. The proposed graduate certificate program in earthquake engineering has been formulated in such a way that it provides adequate training to engineering professionals for safe design of structures in the State of Alaska and other seismically active regions of the world. It is the intent of the School of Engineering that this certificate become a standard qualification for those who regularly practice the structural design in Alaska.

#### **Student opportunities**

The Graduate Certificate in Earthquake Engineering is designed for students employed or seeking employment as practicing civil engineering professionals in the academic, industrial, consulting, and public service sectors with a special emphasize on the earthquake engineering. Certificate owners will be specialists in addressing issues related to safe structural design in Alaska and other seismically active zones.

#### **Student Outcomes**

Upon the completion of this certificate students will be able to :

1. Evaluate the recorded seismograms, perform site response and ground motion parameter estimation.
2. Analyze earthquake characteristics and associated effects on structures, including linear and nonlinear responses.
3. Apply the basic principles for seismic design and construction of structures in accordance with the provisions of International Building Codes.
4. Understand the concepts of dynamic equation of motions and perform analysis for dynamic systems in civil engineering applications.
5. Evaluate dynamic soil properties; analyze earthquake ground response and soil-structure interaction effects, and associated geotechnical engineering problems.

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Graduate Certificate in Earthquake Engineering

6. Evaluate the magnitude and distribution of seismic and other probable loads for strength/stress design and load-resistant factor design.

**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 in **Table 1**. The current average enrollment for the courses is 5.54 students per course. 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.

**Table 1: Historical Enrollment**

Year	2000		2001		2002		2003		2004		2005		2006		2007		2008	
	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F	S	F
CE A610												7				3		3
CE A611							7					9		3		4		
CE A634				6								4				10		
CE A636	4																	
CE A637																		
CE A639																5		7

**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 Arctic Engineering. The UAA School of Engineering has active research groups in the civil engineering disciplines of geotechnical and structural engineering related to this certificate. Most of the research involves the use of equipment currently available in School of Engineering including range of associated apparatus, equipment, and data analysis software. Additional equipment required for research purposes is funded from relevant research grants.

**Fiscal Plan for development and Implementation**

The proposed graduate certificate in earthquake engineering is composed of courses that have been offering by the UAA School of Engineering within the last 8 years, with the exception of CE A637 which is a newly approve course in the civil engineering curriculum. These courses will be continued to be taught as they are the electives towards Master of Science and Master of Engineering degrees in Civil Engineering and as undergraduate technical electives towards the BS degree in civil engineering. No additional financial resources are required to develop or implement the program. The qualified faculty members are available to present the course materials and suitable equipment, instruments and other facilities are on hand. **Table 2** summarizes the incremental financial predictions for the program. Expenses include the proportionate cost (with 3% increase in each subsequent year for inflation adjustment) for a full-time faculty member to administer the program. Revenues are primarily from tuition (with 5% increase in each subsequent year) for an anticipated average enrollment of 10 students per course. Current funding will continue to support their efforts and additional revenues from the tuition increases will allow more varied experiences for students by allowing purchase of software and instruction equipment as needed. Any deficient or balance will be absorbed by the School of Engineering budget.

PROSPECTUS  
Graduate Certificate in Earthquake Engineering

**Table 2: Incremental Expenses and Revenue Projections**

	<b>FY 10</b>	<b>FY 11</b>	<b>FY 12</b>	<b>FY13</b>
<b>Program Expense</b>				
Reassignment (20%) of one full time faculty to administer program	\$ 17,950	\$ 18,490	\$ 19,045	\$ 19,615
<b>Total Expense</b>	\$ 17,950	\$ 18,490	\$ 19,045	\$ 19,615
<b>Program Revenue</b>	(FY 10 Tuition rate = \$316/credit)			
Increases in existing courses *	\$ 21,140	\$ 17,420	\$ 22,428	\$ 18,481
<b>Total Revenue</b>	\$ 21,140	\$ 17,758	\$ 23,307	\$ 19,578
<b>Total Balance</b>	<b>\$ 3,190</b>	<b>\$ -732</b>	<b>\$ 4,262</b>	<b>\$ -37</b>

\* Assumes an average enrollment increase of 4.46 students in each of the courses offered in a year. There are five courses offered in even years and four in odd years. See enrollment projections above.

**Impact on Faculty & Staff**

Administration of the program will be done by the civil engineering department. Faculty resources exist and can be assigned according to School priorities.

**Impact on Student Services**

This program caters to part-time students engaged in professional practice. It is not anticipated that the growth of this program will have a significant impact on the student services resources of the institution.

**Impact on 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. It is expected that this program will increase the use of available library resources.

**Impacts on existing Technology, Facilities & Equipment**

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

**Program Planning**

The courses offered in the graduate certificate program in Earthquake Engineering are listed in the UAA catalog with the exception of CE A636 (a reinstated course) , CE A637 (a new course), and CE A639 (has been offered twice as a temporary course) which were recently approved for inclusion in the catalog. Highly qualified instructors are on hand as full-time faculty members in the UAA School of Engineering. Civil engineering department course materials are continually refined to stay abreast of research findings and of state-of-the-art in 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 administration of their academic progress. As indicated in the attached four-year schedule, the full set of certificate courses will be repeated in every two academic years (**TABLE 3**).

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**Table 3:** Four-Year Course Offering Plan

Course	Title	Credits	2008-2009		2009 -2010			2010 -2011			2011 - 2012		
			Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer
CE A610	Engineering Seismology	3			UD			UD			UD		
CE A611	Geotechnical Earthquake Engr.	3	ZY			ZY			ZY			ZY	
CE A634	Structural Earthquake Engr.	3				HL						HL	
CE A636	Multi-Story Building Structural Design	3	BQ						BQ				
CE A637	Earthquake Resistant Structural Design	3				BQ						BQ	
CE A639	Loads on Structures	3			BQ			BQ					

UD: Dr. Utpal Dutta; ZY: Dr. Zhaohui (Joey) Yang, HL: Prof. Helen (He) Liu; BQ: Prof. T. Bart Quimby

**Faculty and Staff**

The following faculty are available to teach these course and will be assigned through normal school scheduling policies:

**T. Bart Quimby, PE, Ph.D.**, Professor, Department of Civil Engineering, UAA

- \* Ph.D., Brigham Young University, 1988
- \* M.S., Brigham Young University, 1982
- \* B.S., Brigham Young University, 1981

**He Liu, PE, Ph.D.**, Professor, Department of Civil Engineering, UAA

- \* Ph.D., Civil Engineering, University of New York at Buffalo
- \* M.S., Civil Engineering, Beijing Polytechnic University
- \* B.S., Civil Engineering, Beijing Polytechnic University

**Zhaohui (Joey) Yang, Ph.D.**, Assistant Professor, Department of Civil Engineering, UAA

- \* Ph.D., University of California, Davis.
- \* M.S., B.S., Chengdu University of Science and Technology, Chengdu, China.

**Utpal Dutta, Ph.D.**, Associate Professor, Department of Civil Engineering, UAA

- \* Ph.D., Indian School of Mines, Dhanbad, India
- \* M.Sc(Tech), Indian School of Mines, Dhanbad, India

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**Graduate Certificate in Earthquake Engineering**

The UAA School of Engineering offers a sequence of courses leading to a Graduate Certificate in Earthquake Engineering. This certificate program is intended to provide specialized education to enhance the theoretical knowledge and practical skills of civil engineers to deal with earthquake-resistant structural design. Upon completion of the certificate program, students will have specialized knowledge and skills applicable to various aspects of earthquake engineering issues.

**Student Outcomes**

Upon Completion of this certificate students will be able to:

1. Evaluate seismograms and perform site response analysis.
2. Analyze earthquake characteristics and associated effects on structures, including linear and nonlinear responses.
3. Apply the basic principles for seismic design and construction of structures in accordance with the provisions of International Building Codes.
4. Understand the concepts of dynamic equations of motion and perform analysis for dynamic systems in civil engineering applications.
5. Evaluate dynamic soil properties; analyze ground response and soil-structure interaction effects, and other geotechnical engineering problems.
6. Evaluate the magnitude and distribution of seismic and other probable loads for strength, stress and load-resistant factor design.

**Admission Requirements and Related Graduate Certificate Policies**

See the beginning of this Chapter for Graduate Certificates University Requirements. Admission to the Earthquake 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 courses:

<b>Course Number</b>	<b>Course</b>	<b>Credits</b>
CE A610	Engineering Seismology	3
CE A611	Geotechnical Earthquake Engineering	3
CE A634	Structural Earthquake Engineering	3
CE A636	Multi-story Building Structural Design (3)	
	<u>OR</u>	3
CE A637	Earthquake Resistant Structural Design (3)	
CE A639	Loads on Structures	<u>3</u>
	Total	15

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**Catalog Copy of Component Course Descriptions**

**Course Title:** CE A610 Engineering Seismology (3 credits), **Prerequisite:** CE A435 with a minimum grade of “C”, **Registration Restrictions:** Graduate level or undergraduate senior standing, or instructor approval. **Course Description:** Covers internal structure of the earth, causes and occurrence of earthquakes, seismic waves and their propagation, seismograms, strong ground motion measurements, accelerometers and seismic network, data processing and interpretation of strong motion records, estimation of ground motion parameters and spatial variability, probabilistic and deterministic seismic hazard assessment with special reference to Alaska.

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**Course Title:** CE A611 Geotechnical Earthquake Engineering (3 credits), **Prerequisite:** CE A435 with a minimum grade of “C”, **Registration Restrictions:** Graduate level or undergraduate senior standing, or instructor approval.

**Course Description:** Covers earthquakes and seismology, strong ground motion measurement, seismic hazard analysis, ground response analysis, dynamic soil properties, liquefaction, soil-structure interaction, seismic slope stability, and seismic design of retaining structures, with applications to cold regions geotechnical earthquake engineering problems.

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**Course Title:** CE A634 Structural Earthquake Engineering (3 credits), **Prerequisite:** [CE A431 and CE A633] with a minimum grade of “C”, **Registration Restrictions:** Graduate level or undergraduate senior standing, or instructor approval.

**Course Description:** Introduces basic seismic concepts and design principles. Criteria for design and construction of structure subject to earthquake ground motions. Also includes technology for reducing earthquake loads through seismic isolation.

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**Course Title:** CE A636 Multi-story Building Structural Design (3 credits), **Prerequisite:** [CE A431 and CE A432 and CE A433 and CE A639] with a minimum grade of “C”, **Registration Restrictions:** Graduate level or undergraduate senior standing, or instructor approval.

**Course Description:** This course teaches the design of structural systems for buildings. Topics covered include the selection and analysis of structural systems, building codes and their origins, and an introduction to the development of design drawings and specifications.

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**Course Title:** CE A637 Earthquake Resistant Structural Design (3 credits), **Prerequisite:** [CE A431 and CE A432 and CE A433 and CE A639] with a minimum grade of “C”, **Registration Restrictions:** Graduate level or undergraduate senior standing, or instructor approval.

**Course Description:** Covers the special structural detail requirements for earthquake design in steel, concrete, timber, and masonry.

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**Course Title:** CE A639 Loads on Structures (3 credits), **Prerequisite:** [CE A431 and CE A435 and CE A435L] with a minimum grade of “C”, **Registration Restrictions:** Graduate level or undergraduate senior standing, or instructor approval.

**Course Description:** Covers the computation of loads on structures using ASCE 7, Minimum Design Loads for Buildings and Other Structures. The computation of loads (dead, live, soil, flood, snow, wind, and seismic) and probable combinations of loads will be covered.

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