University of Alaska Engineering Expansion Initiative

Primary Goal:

By 2012, UAA and UAF will produce 200 undergraduate trained engineers annually, more than doubling the annual number of current undergraduate trained engineers.

Secondary Goals:

- By 2012, produce 20 baccalaureate Construction Management graduates and train 40-60 certificate and two-year Construction Technology program graduates annually. The two-year associate degree and certificate Construction Technology program started in fall 2006 with 69 students and 25 students in the first baccalaureate Construction Management class this fall (2007).
- By 2012, including the 200 undergraduate trained engineers, produce a total of 340 graduates in engineering related programs from certificate and associate to PhD level programs. This includes surveying and mapping, masters programs and post-baccalaureate certificates in areas such as Arctic Engineering.
- Increase the number of Project Management certificate and master degree recipients.
- Increase the number of students graduating from Alaska high schools who desire a career in engineering. These students will have the necessary math and science skills to be successful in engineering. A special emphasis will be placed on attracting UA Scholars and first-generation college students. The university will do this by:
 - Increasing outreach efforts to middle school and high school students including:
 - o Career awareness opportunities
 - o Sponsored math, science, and engineering type competitions
 - Summer math and science intensives through UA campuses
 - Institutionalizing the Alaska Native Science and Engineering Program (ANSEP) model.
 - Increasing outreach efforts to middle and high school math, vocational, and science teachers for curriculum support and student preparation awareness.
 - Provide merit and need-based college scholarships for students entering engineering programs who have demonstrated adequate high school math and science preparation.
- Expand Engineering Research capacity in areas important to Alaska including Transportation, Energy, and Climate Adaptation. Over the next four years, increase engineering related research by 50 percent from \$18 million to \$27 million.

- Expand professional development opportunities for existing professionals as continuing education will be required for maintenance of the PE license. Additionally, the National Council of Examiners for Engineering and Surveying (NCEES) Model Law adopted in 2006 proposes that licensing Boards require a MS or PhD in engineering, or at a minimum 30 credits of acceptable coursework beyond the BS degree, beginning in 2015.
- Develop 1+3 programs at Juneau, Mat-Su, Kenai and other UA community campuses as first-year feeder programs into the UAA and UAF engineering programs.
- Increase the number of scholarships available to engineering students reaching senior status in time to graduate within 5 years. Promote on-time graduation and full-time enrollment to completion. Providing for an initial goal of an annual \$10,000 scholarship (room, board, books, tuition and fees) for 100 senior engineering students would cost \$1.0 million annually.
- Develop centers of excellence in niche disciplines such as Energy, Arctic Engineering, and Transportation through establishing ten named professor positions (five-year private funding commitments of \$250,000/yr/professor).

Current Status:

University of Alaska's undergraduate engineering programs are listed below. Relative to public university engineering program offerings in small western states the breadth of Alaska's engineering programs is reasonable, but not above average. The programs at UAA and UAF are complementary and collaborative with UAA offering general engineering with select emphases while UAF offers specialized discipline programs. Civil Engineering is the most popular discipline and requires the most graduates; therefore it is appropriate that it is provided at both locations.

7	Engineering - Computer emphasis	UAA
1	Engineering - Electrical emphasis	UAA
>	Engineering - Mechanical emphasis	UAA
×	Geomatics	UAA
>	Civil Engineering	UAA, UAF
1	Mechanical Engineering	UAF
>	Electrical Engineering	UAF
7	Computer Engineering	UAF
×	Petroleum Engineering	UAF
>	Geological Engineering	UAF
7	Mining Engineering	UAF

Through the programs currently offered at UAA and UAF, 80 students earn undergraduate engineering degrees each year. Prior to the addition of the UAA general baccalaureate engineering (BSE) program, UAA graduated about 30 students; this number will increase to 90 by 2012. At UAF, 50 students receive baccalaureate degrees annually, with 110 expected in 2012.

The number of new students entering UA's undergraduate engineering programs reached more than 230 this fall, 130 at UAF and 100 at UAA. This compares to 80 first-time freshmen entering three years ago and 150 last year. Of these students, 46 are UA Scholars, nearly three times the number attending last year.

Other University of Alaska engineering related programs include:

- Programs for undergraduate engineering majors:
 Engineering 2+2 Collaborative (UAA, UAF)
 Alaska Native Science and Engineering Program (ANSEP)
- Engineering support careers including: GIS, Geomatics, Surveying and Mapping, CAD Training Construction Technology, Process Technology, Instrumentation Construction Management, Project Management
- Engineering graduate level degrees and certificates: Arctic, Electrical, Mechanical, Petroleum, Mining, and others.

Recent Investments in UA's Engineering Programs:

The engineering instruction programs at UAA and UAF cost \$10.4 million in FY07 (UAA \$4.2 million, UAF \$6.2 million). This total is up from \$6.5 million three years ago (UAA \$2.4 million and UAF \$4.1 million). With the exception of minimal state funded salary and benefit increases and the investments noted below, internal campus reallocations and tuition revenue have been the primary sources of the engineering expansion at both UAA and UAF. Additionally, UAF's Institute of Northern Engineering research faculty conduct nearly \$18 million in research annually of which only \$2 million is funded from state general funds.

UAA investments:

- FY06, UAA's BSE program started with a combination of UAA funding reallocation and temporary UA funding totaling \$200,000. There was an additional \$200,000 of temporary funds provided for professional development and the Construction Technology programs.
- FY07, state funding was appropriated to base for UAA's ANSEP program, BSE program faculty, engineering professional development, and related general education support courses totaling \$780,000.
- FY08, the Board imposed a system-wide reallocation for health and engineering programs, with UAA engineering receiving an additional \$200,000 for BSE faculty. There was also one-time workforce development funds provided for the start-up of the Construction Management program.

UAF investments:

FY07, state funding of \$150,000 was appropriated to fund career awareness activities, student recruitment efforts, and engineering instruction faculty to increase the number of new students.

Also in FY07, \$250,000 in-state funding was provided for engineering research related to the public/private partnership in cold climate housing and energy.

Current State Funding Requests:

The UA Board of Regents' FY09 proposed budget includes a \$2.2 million state funding request for Engineering and Construction Management program expansions augmented by \$810,000 from resulting tuition revenue and grants for total program funding of \$3 million. There is also state funding of \$500,000 requested for Energy research and \$500,000 for Transportation research related to the University Transportation Center.

- UAA: \$1.15 million of the state funding is requested for UAA including a total of 8 faculty for BSE program, Civil Engineering, Geomatics, Construction Management and related advising and general education requirements.
- UAF: \$850,000 of state funding is requested for student recruitment, advising for student success, core instruction in math and physics, lab equipment, graduate assistants for added lab focus, support of a graduate certificate in Construction Management and a modest amount for additional engineering instruction faculty. The Transportation and Energy research funding requests are centered within the UAF Institute of Northern Engineering.
- UAS: \$100,000 is requested for a 1+3 program in Juneau and \$65,000 for mining training support.

Future-Year Funding Needs:

Facilities and Equipment:

- Expansion of facilities for classrooms, laboratories, additional teaching equipment, faculty offices, and research space is critical to meet these initiative goals.
- UAA proposed an expansion to its engineering facility in the FY09 capital budget request. Two years prior, due to the impact of instruction program growth and dramatic engineering related research growth at UAF, a new engineering building was proposed as part of UAF's 6-year capital plan.
- The Board of Regents' FY09 proposed capital budget request includes planning funds for both facilities: \$2.5 million for UAF's engineering building (expected project cost \$35 million) and \$2.0 million for UAA's expansion (estimated project cost \$12 million).
- Partnering with industry for facilities has been successful at other universities including Oregon State University (see http://engr.oregonstate.edu/prosperity/building/, http://engr.oregonstate.edu/prosperity/building/naming.php, http://engr.oregonstate.edu/prosperity/building/power.html)

Engineering and General Education Faculty to Meet Student Demand:

- The Board of Regents' FY09 operating budget request provides the faculty and graduate teaching assistants to meet FY09 student demand. Assuming the Governor and legislature provide sufficient funding based on current declared students progressing to junior and senior status and the planned incoming class in FY10, at least seven additional engineering programs and general education support faculty will be required for the two programs.
- Engineering faculty salaries are increasing as demand for engineers in private industry is increasing. Funding may be required to maintain competitive in recruiting and retaining the engineering faculty necessary to fully realize the goals of this initiative.

Advising, Tutoring, and Mentoring for Student Success:

- Meeting the stated engineering initiative goals requires sufficient advisors and mentors to enhance student success. Outreach efforts in middle and high schools, and retention of students while in engineering requires active involvement of advisors and mentors to guide students. Below are a few examples:
 - Summer intensives workshops for middle and high school student focused on math, engineering and vocational technology: A two week session accommodating 300 students will cost \$200,000.
 - Perspective-Reaching 300 9th graders:
 Fewer than 65% of the reported 11,500 Alaska ninth-graders graduate from high school which is near the bottom in the nation. There are about 7,300 Alaska high school graduates annually of whom fewer than 46% go to college; this is again near the bottom in the nation. Of the graduates who go to college over 60% attend in-state at UA; that is about 2,100 first-time freshmen, which is below national average, but significantly improved from the 45% attending in-state 10 years ago. Of those that do attend UA, two-thirds require remedial education, many in more than one subject and for more than one-semester (i.e. 2 or 3 semesters of math, English, and science). Reaching 300 ninth-graders is 2.5% of the Alaska ninth-graders. Setting a target of 20 annual intensive workshops could reach 50% of Alaska ninth-graders (\$4 million).
 - Sponsoring high school math and engineering competitions such as Lego Robotics and national math and computer programming contest. A state director who organizes industry volunteers and support events in various communities would cost \$300,000 annually.
 - o Increase collaboration with school districts to encourage dual credit.

Measures of Success:

Below are a few indicators that will be followed to predict and measure success of this initiative.

Increase enrollment and retention rates of students with declared engineering majors

- Increase graduation rates in the engineering disciplines
- Create joint college and School of Engineering alliances that include regular gatherings of the representatives to collaborate towards attaining aligned goals
- Conduct regular joint meetings among colleges and School of Engineering advisory councils, and dean/faculty/staff groups
- Establish joint strategies to be implemented and supported by UA engineering programs
- Increase number of internship and scholarship opportunities
- Maintain the excellent in-state job placement rates for UA engineering graduates