ABET
Self-Study Report

for the

B.S. Mining Engineering Program

at

University of Alaska Fairbanks

Fairbanks, Alaska

June 2011

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UAF College of Engineering & Mines

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BACKGROUND INFORMATION

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B. Program History

Mining Engineering is one of the founding fields of study at the University of Alaska (UA), which was established originally as the Alaska Agricultural College and School of Mines in 1917. The program is housed in the Department of Mining and Geological Engineering (DMGE) in the College of Engineering and Mines (CEM), which formed in 2004 after the School of Mineral Engineering (then home of DMGE) merged with the engineering programs of the College of Science, Engineering, and Math. In 2010, CEM grew with the addition of the Department of Computer Science.

As the northernmost accredited Mining Engineering program in the U.S., this academic program is the only one in the nation that offers a bachelor of science degree in Mining Engineering with an emphasis on engineering training for arctic and subarctic regions. Over the years, graduates of the program have been instrumental in the development of Alaska's natural resources including gold, lead, zinc, oil, gas, coal, and many other major minerals. Our graduates have been employed as engineers in all the major mines in Alaska, including the Red Dog Mine, Greens Creek Mine, Fort Knox Mine, Pogo Mine, and Usibelli Coal Mine. Many of the program's graduates are employed as engineers in the petroleum industry and construction industry, and in state government agencies. Our graduates also work in mining companies and engineering firms in the Lower 48, and some have become managers and administrators in state and federal governments as well as in major corporations worldwide.

The program has undergone many changes since the last review in 2005. These changes are detailed in Section G below and in Section 4C. In brief, they include the following:

- Significant program changes such as addition/deletion of courses
- Changes in assessment methodologies
- Faculty training

C. Options

None.

D. Organizational Structure

The University of Alaska Fairbanks (UAF), with its main campus in Fairbanks, Alaska, is one of the three universities that together form the University of Alaska (UA) System. The other two universities in the system are the University of Alaska Anchorage (main campus, Anchorage) and the University of Alaska Southeast (main campus, Juneau). Academics at UAF are spread primarily across "schools" and "colleges," with schools being narrower in focus and smaller than colleges. At UAF, there are four colleges (College of Engineering and Mines, College of Liberal Arts, College of Natural Science and Mathematics, and College of Rural and Community Development) and four schools (School of Management, School of Fisheries and Ocean Sciences, School of Natural Resources and Agricultural Sciences, and School of Education). See next page for a broad organizational layout.

The College of Engineering and Mines was formed in 2004, with the merger of five engineering departments. Prior to 2004, the engineering departments were in two separate colleges, along with other departments. The Computer Science Department joined CEM in 2010.

Academic Organization

There are six academic departments within the College of Engineering and Mines (CEM: www.alaska.edu/uaf/cem), including the Department of Civil and Environmental Engineering, the Department of Computer Science, the Department of Electrical and Computer Engineering, the Department of Mechanical Engineering, the Department of Mining and Geological Engineering, and the Department of Petroleum Engineering. CEM is led by a Dean and two Associate Deans, one for academics and one for research. The Associate Dean for Research also serves as the Director of the Institute of Northern Engineering.

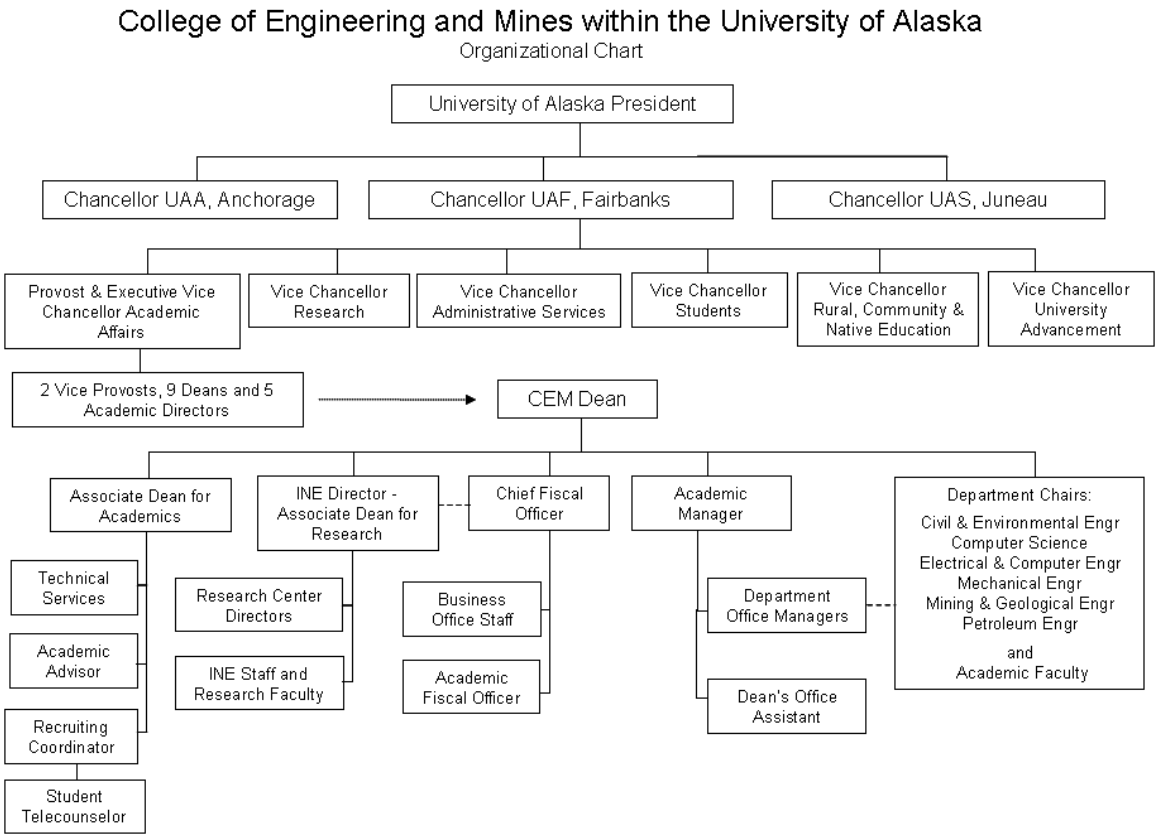
Research Organization

The Institute of Northern Engineering (INE: ine.uaf.edu) is the research arm of the College of Engineering and Mines. Most college research is conducted through INE, which provides support for proposal preparation and project management for externally funded grants. Within the institute are seven centers in which focused research, development, and testing take place. INE promotes interdisciplinary and collaborative research and development; promotes partnerships with the natural and social sciences, education, business, geography, natural resource management, and law; promotes outreach; and fosters opportunities for faculty, post-doctoral researchers, and students to engage in research.

The Program

The Mining Engineering bachelor of science (B.S.) program is housed at the Department of Mining and Geological Engineering (DMGE). Besides offering a B.S. in Mining Engineering, the DMGE offers a B.S. in Geological Engineering, a Master of Science (M.S.) in Mining Engineering, an M.S. in Geological Engineering, and a doctoral degree (Ph.D.) in Engineering (Mining Engineering and Geological Engineering options). Additionally, the program houses the M.S. program in Mineral Preparation Engineering, taught by the faculty of the Mineral Industry Research Laboratory (MIRL). As a research unit, MIRL cannot house academic

programs. The DMGE has eight faculty (four in Mining Engineering and four in Geological Engineering) and an office manager.



E. Program Delivery Modes

The Mining Engineering program is a traditional daytime lecture/laboratory-based program. No online or distance education courses in engineering (Mining Engineering or Engineering Science) are offered, though a Mining Engineering student could take an online/distance education course in a non-engineering field (commonly humanities) to meet program requirements.

F. Program Locations

The Mining Engineering program is offered in one location only: at the main campus of UAF in Fairbanks, Alaska.

G. Deficiencies, Weaknesses or Concerns from Previous Evaluation(s) and the Actions Taken to Address Them

The Final Statement (2008) of the Interim Report, issued following the last (2005) visit, identified a single concern, which is quoted below:

Statement from 2005 visit, quoted in the Interim Report 2008:

> Criterion 3. Program Outcomes and Assessment *Criterion* 3 *requires that there be a process in place to produce the outcomes and an assessment process with documented results that demonstrates that these outcomes are being measured and indicates the degree to which they are being achieved. The mining program used pre and post course surveys as the primary measure of assessment. Other tools have been used, but only on an ad hoc basis. There is a lack of significant documented evidence of program improvement based on the assessment process results. In due process, the EAC received information indicating that the mining program was exploring other tools for outcome and assessment. There remained a lack of significant evidence of program improvement based on the results.*

Statement from Interim Report 2008:

> *The interim report provided information concerning a revised set of processes related to assessment of program outcomes. This outcomes assessment process makes use of three components:*
>
> > *(1) Surveys administered to students pre-course and post-course concerning Criterion 3 outcomes "a" through "k." The post-course surveys focus on asking students how much the course in question covered the outcomes.*
> >
> > *(2) Evaluation of the design course presentations by external professionals as well as the faculty.*
> >
> > *(3) Analysis of the general portions of the Fundamentals of Engineering examination results has been in place for some time, but in the future individual subject results will be analyzed as well.*
>
> *The new process elements do strengthen the outcomes assessment process, but student course assessments reflect only how much the students perceived the course covered the outcomes, not the degree to which the outcome is attained by the students. There is little measurement of outcome attainment that is based on direct evidence of student learning other than the assessment of the major design experience, which is team-based. Due to the size of the graduating class, it has been possible to evaluate individual student attainment of outcomes through this assessment of the major design experience, but there is concern that this may not always be possible. To ensure continued compliance with this criterion, the outcomes assessment process should be further strengthened.*
>
> • *The weakness is now cited as a concern.*

Actions Taken: In response to the concern, the following was done:

1. Faculty were trained on ABET assessment methods.
2. Rubrics have been developed to directly and indirectly assess individual courses after every offering. As will be presented later in the report, this has resulted in improvements.
3. Performance indicators have been developed to directly and indirectly assess program outcomes.

These new assessment methodologies supplement (or include) others, such as pre-course and post-course surveys, periodic stakeholder surveys, and detailed reviews of the program by the program advisory board and faculty.

H. Joint Accreditation

None.

GENERAL CRITERIA

CRITERION 1. STUDENTS

A. Student Admissions

There are three pathways for a student to be admitted to the B.S. (Mining Engineering) program.

1. As a first time freshmen, the student needs, at the minimum, all of the following:
    a. High school diploma or equivalent
    b. Pass a high school core of 16 credits with a minimum GPA of 2.5
    c. Must have taken SAT/ACT in the past two years
    d. High school GPA of 3.0 OR
        i. High school GPA of 2.5 AND
        ii. ACT composite score of 18 or SAT total score of 1290 (writing skills included)
    e. Must have completed the following in high school: 4 credits of English, 2 credits of algebra, 1 credit of geometry, ½ credit of trigonometry (an additional ½ credit of advanced math is recommended), 3 credits of social sciences, 1 credit of physics or chemistry, 1 credit of natural sciences, 1 credit of elective. Both physics and chemistry are recommended.
2. As a transfer student, the student needs, at the minimum, all of the following:
    a. If the student is transferring with at least 30 credits, then
        i. Must have left the previous institution in good academic standing
        ii. Must have a minimum GPA of 2.0 in each transferred course
        iii. Transferred course work must be relevant to engineering
    b. If transferring with less than 30 credits, then the student must meet freshmen admission standards.
3. As a change of major for a current UAF student in a four-year degree program, the student needs the approval of a Mining Engineering faculty member and the department chair of DMGE. Students in a two-year program cannot change their major to a four-year degree program; they must apply for admission into the program.

A student who does not meet the entrance requirements is placed into a “Pre-major” sub-group of Mining Engineering; this applies even to change of majors. The first two pathways are administered by the Office of Admissions (including making the admission decision), while the last pathway is handled by the Registrar’s Office, with the admission decision resting on the department chair of DMGE.

B. Evaluating Student Performance

UAF requires early grade reports for all freshmen students at the end of 6 weeks. These grades are reported to students on their UAOnline account. The goal is to give freshmen students early feedback on their performance in all classes. With early grade information, students can take appropriate action, seeking help in specific classes, giving more attention to classes where they are not performing optimally, or if necessary withdrawing from a class before the deadline for student-initiated withdrawal. Help is available in several tutoring centers, including the College of Engineering and Mines Tutoring Center and the Math Lab. CEM employs an academic advisor who concentrates on incoming freshmen and lower-division students, but can advise students at all levels. The CEM academic advisor provides guidance to students on their options to appropriately deal with lower-than-optimum early grade reports.

To remain in good academic standing, undergraduate students at UAF must maintain a cumulative GPA and most recent semester GPA of 2.0 or better.

Students whose cumulative and/or semester GPA falls below 2.0 after each fall and spring semester are put on academic probation. Students on probation may not enroll in more than 13 credits a semester, unless an exception is granted by the appropriate dean. Probation may include additional conditions, as determined by the dean of the college or school of the student's major. Students on probation will be referred for developmental advising/education and/or to an advising or support counseling center. Removal from probation requires that the student's cumulative and semester GPAs are at least 2.0.

The CEM academic advisor communicates with all CEM students on probation after each semester, guiding them on appropriate actions to take, including revision of course selection for the following semester.

A couple of years ago, the UAF registration system implemented the "Banner Mandatory Placement" prerequisite and co-requisite verification prior to registration on each course, with CEM volunteering to be a test college. All registration occurs online, and students cannot register for courses for which they do not have the proper prerequisites and co-requisites. This process has greatly reduced problems of students being in courses without having the proper prerequisites, a condition that leads to trouble and possible failure. Occasionally, there are extenuating circumstances. CEM has a prerequisite and co-requisite waiver form that is used to document any waived prerequisite or co-requisite. The form contains justification for the waiver, including conditions and date conditions, and requires the signatures of student, instructor, advisor, and department chair.

Faculty and students also have access to *DegreeWorks*©, an online system that allows them to monitor progress, and conduct what-if analysis with graduation. *DegreeWorks*© is in addition to UAOnline, which allows students to view their transcripts online.

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C. Transfer Students and Transfer Courses

A transfer student is defined as someone coming into UAF with at least 30 transferable semester credits. Transfer students are eligible for admission to a baccalaureate program if their GPA in previous course work is at least 2.0 and they left their previous institution(s) in good standing. If applying to a technical or scientific program, students may need to present a higher grade average and proof that they have completed appropriate background courses before they will be admitted. Students transferring into a baccalaureate degree program with fewer than 30 semester hours of transferable credit must also meet the freshman admission requirements. Admission status for students who have attended an unaccredited postsecondary institution will be determined on an individual basis.

Credit accepted at UAF that has been earned from other regionally accredited institutions or through military educational experiences or accepted by special approval is considered transfer credit. Where possible, transfer credit is equated with UAF courses. Lists of substitutions within the University of Alaska System are available on page 36 of the UAF Catalog. Standard substitutions from non-University of Alaska institutions are also available on page 37 of the catalog. UAF is a member of the Servicemembers Opportunity Colleges (SOC) network. For additional information about the SOC program, contact the Office of Admissions.

UAF's transfer credit resource website (uaonline.alaska.edu) is an unofficial reference for undergraduate students who are considering transferring to UAF. An official evaluation of transfer credits may be obtained only after formal application and admission to degree-seeking status with UAF.

In order to serve students who transfer among the three institutions that form the University of Alaska System, UAF, UAA and UAS have identified fully transferable general education requirements for baccalaureate degrees. Credit for course work successfully completed in general education requirements at one UA institution will fulfill the same categories at all other institutions. This applies even if there is no directly matching course work at the institution to which the student transfers. Transfer students from UAA or UAS who have completed all general education requirements in the baccalaureate program prior to transferring to UAF will have completed all requirements for the UAF baccalaureate core. Courses taken to complete the general education requirements at UAA or UAS will meet UAF baccalaureate core requirements according to the current table of substitutions for intra-UA transfers. Completion of the 35-credit lower-division requirements (100- and 200-level courses) of the UAF baccalaureate core meets the general education requirements at UAA and UAS. More information about transfer credit is available at www.uaf.edu/admissions/undergrad/transfer. The Transfer Credit Resource Database is used to facilitate transfer of other courses.

The UAF Admissions Office evaluates transfer students and course credits, often calling the department chair for specific engineering or computer science course-transfer equivalencies. The standard approach for evaluating course equivalency is to compare course syllabi, noting course content, course level, prerequisites, course textbook, and credit hours. Sometimes a direct one-to-one course transfer equivalency is not possible, but often a block of transfer courses can be demonstrated as equivalent to several UAF courses. This type of block transfer is especially important when students transfer from a university on the quarter system. Each quarter credit hour is equivalent to two-thirds of a semester credit hour.

D. Advising and Career Guidance

CEM employs an academic advisor, who concentrates on incoming freshmen and lower-division students, but can advise students at all levels. Once engineering and computer science students start taking classes within their departments, advising is transferred to the department. Some incoming freshmen go straight to the department for advising and bypass the CEM academic advisor. The CEM academic advisor maintains an office with posted office hours and generally is easy to find. This individual is well trained in many of the questions and situations encountered by incoming freshmen. The duties of the position include the following:

a. Advise students on academic course selection, especially incoming freshmen during the summer months. After students are established in a discipline, they are generally transitioned to department faculty for advising. The advisor position is a 12-month position, so students that visit in the summer or try to register in the summer are generally advised by the CEM academic advisor.

b. Help students with non-academic as well as academic issues, including housing, financial aid information, university resources for transitioning to college life, study skills workshops, etc.

c. Act as an early intervention advisor for freshmen who do not perform well in the first few weeks of a semester, as indicated by poor attendance or low homework scores. These students are contacted by the academic advisor to see if something can be done to mitigate the situation.

d. Oversee the engineering tutoring lab, which includes hiring tutors and maintaining records of use.

Mining engineering majors are assigned a Mining Engineering faculty member as an advisor, though depending on their admission pathway, they may see the CEM academic advisor for a semester or two while they are pre-majors. The CEM academic advisor has been instructed to direct all students with an interest in mining to see a Mining Engineering faculty. Students cannot register without consulting with an advisor, though a student may go to an unassigned advisor (such as the Academic Advising Center or AAC) when the assigned advisor is unavailable. To improve advising across campus, the AAC now only sees undeclared majors. Therefore, unless a student is not officially a Mining Engineering major, it is nearly impossible not to see a Mining Engineering faculty advisor. In any case, Mining Engineering faculty are famous for their open-door policy; therefore, students rarely ever need to seek advice outside the program. Note that Drs. Sukumar Bandopadhyay and Rajive Ganguli, two faculty of Mining Engineering, have won the Carol Feist Advising Award from UAF, while Prof. Gang Chen is a multiple winner of the Professor of the Year Award (from Mining Engineering students).

Advising sessions cover not only course registration advice, but also career and non-curricular professional topics (such as participation in the SME Student Chapter, internships, and internal and external scholarships). Faculty (informally) also help connect employers to students. The department maintains a Facebook page (http://www.facebook.com/UAF.MinGeoEngg) and email lists, which have been very helpful in disseminating advice and information.

Additional advising and career guidance are offered by UAF Career Services, which is active in providing engineering and computer recruiting events, and holds multiple targeted recruitment/employer events on campus every year.

E. Work in Lieu of Courses

As mentioned previously, a student can also utilize past professional experience to obtain course credit. However, this is an almost impossible pathway towards course credit, as most professional experiences do not cover every aspect of an engineering course. Other ways to obtain credits for work in lieu of courses include advanced placement (AP) credit, high SAT/ACT scores, and testing out. Advanced placement in certain courses is possible for incoming students provided they have 3 or above in the appropriate College Board (CEEB) AP courses in high school. Similarly, high SAT/ACT scores in the appropriate category can get credit for ENGL 111X. Students can test out of a few courses through the nationwide College Level Examination Program (CLEP). However, both advanced placement and testing out are possible only for a few credits of lower-level courses. Details of alternative ways to obtain credit are given in the UAF Catalog.

F. Graduation Requirements

The graduation requirements of the program are:

1. Complete the general university requirements. (See page 131. As part of the core curriculum requirements, complete: CHEM F105X, CHEM F106X, LS F101X and MATH F200X.)

2. Complete the B.S. degree requirements. (See page 136. As part of the B.S. degree requirements, complete: MATH F201X, PHYS F211X and PHYS F212X.)

3. Complete the following program (major) requirements:*

ES F208—Mechanics	4
ES F307—Elements of Electrical Engineering	3
ES F331—Mechanics of Materials	3
ES F341—Fluid Mechanics	4
ES F346—Basic Thermodynamics	3
GE F261—General Geology for Engineers	3
GEOS F262—Rocks and Minerals	3
GEOS F332—Ore Deposits and Structure	3
MIN F103—Introduction to Mining Engineering	1
MIN F104—Mining Safety and Operations Lab	1
MIN F202—Mine Surveying	3
MIN F225—Quantitative Methods in Mining Engineering	2
MIN F226—Introduction to Mine Development	2
MIN F301—Mine Plant Design	3
MIN F302—Underground Mine Environmental Engineering	3
MIN F313—Introduction to Mineral Preparation	3
MIN F370—Rock Mechanics	3
MIN F407W—Mine Reclamation and Environmental Management	3

MIN F408O—Mineral Valuation and Economics 3
MIN F409—Operations Research and Computer Applications in Mineral Industry 3
MIN F443—Principles and Applications of Industrial Explosives 3
MIN F454—Underground Mining Methods 3
MIN F482—Computer Aided Mine Design-VULCAN..... 3
MIN F484—Surface Mining Methods II 2
MIN F489W—Mining Design Project I 1
MIN F490W—Mining Design Project II 2
MIN F485—Mining Engineering Exit Exam..... 0

4. Complete the following program (major) requirements:
   MATH F202X—Calculus 4
   MATH F302—Differential Equations 3
5. Complete 3 credits* from the following recommended technical electives:**
   GE F440—Slope Stability..... 3
   MIN F401—Mine Site Field Trip 2
   MIN F447—Placer Mining 3
   MIN F472—Ground Control..... 3
   MIN F481—Computer Aided Mine Design-TECHBASE 3
   MIN F415—Coal Preparation 3
   MIN F646—Mining Engineering in the Arctic..... 3
   CE F603—Arctic Engineering 3
   Approved technical electives..... 3 – 6
6. Minimum credits required 132

** Student must earn a C grade or better in each course.*

*** Students must plan their elective courses in consultation with their Mining Engineering faculty advisor. Technical electives are selected from the list of the approved technical electives for the Mining Engineering program and other program course listings. All elective courses must be approved by the department head.*

In addition to the above requirements, the student is required to take the FE exam.

A few processes are in place to ensure that students stay focused on meeting graduation requirements:

1. Academic Plan: Mining Engineering students are provided with a four-year academic plan that takes into consideration prerequisites and course offering sequences (not all courses are offered every semester or every year). Students are encouraged to follow the plan faithfully, though it is only partially relevant to many since they transfer into the program or enter the program as pre-majors (i.e., not fully qualified to take program courses). Additionally, students and advisors have access to *DegreeWorks*©, an online tool, described as an academic GPS (Graduation Positioning System), that can be used

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to monitor progress toward graduation, make an academic plan for the future, and identify unfulfilled requirements.

2. Advising: As mentioned before, students are required to see a faculty advisor prior to registering for classes. A big part of advising sessions is to monitor a student's progress toward graduation, which is very important since the academic plan is not entirely relevant to all Mining Engineering students.
3. Retention strategies: While advising helps students stay focused toward graduation, it does not help them succeed in courses, the key graduation requirement. CEM offers free tutoring sessions to all engineering majors to help them with engineering courses. Additional free help is available for math courses through the Math Laboratory. Students that meet certain race, income, or family background criteria also get free tutoring through UAF's Student Support Services.

Graduates are awarded a Bachelor of Science in Mining Engineering.

G. Transcripts of Recent Graduates

(Supplied separately.)

CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES

A. Mission Statement

The University of Alaska Fairbanks has the following stated mission:

> The University of Alaska Fairbanks, the nation's northernmost Land, Sea and Space Grant university and international research center, advances and disseminates knowledge through teaching, research and public service with an emphasis on Alaska, the circumpolar North and their diverse peoples. UAF—America's arctic university—promotes academic excellence, student success and lifelong learning.

This mission statement is posted at http://www.uaf.edu/uaf/about/mission.html

The mission of the College of Engineering and Mines is as follows:

> The College of Engineering and Mines at the University of Alaska Fairbanks advances and disseminates technical and scientific knowledge through innovative teaching, research and public service with an emphasis on Alaska and other high-latitude regions. The College promotes students' self motivation to excel and guides them towards professional careers and entrepreneurship in an environment of life-long learning.

In line with the above mission statements, the mission of the Mining Engineering program is:

> As the nation's northernmost accredited Mining Engineering Program, our mission is to advance and disseminate knowledge for exploration, evaluation, development and efficient production of mineral and energy resources with assurance of the health and safety of persons involved, and protection of the environment, through creative teaching, research, and public service with an emphasis on Alaska, the North, and its diverse peoples.

This mission statement is posted at
http://www.alaska.edu/uaf/cem/min/about/abet.xml

B. Program Educational Objectives

To graduate competent engineers who will be:

- employed in the mineral and energy industries
- solving problems germane to Alaska
- professional and understand the need to stay technically current

This is posted at http://www.alaska.edu/uaf/cem/min/about/mission.xml

C. Consistency of the Program Educational Objectives with the Mission of the Institution

The program educational objectives (PEOs) were designed to be consistent with the mission of the institution.

The mission statement of UAF emphasizes Alaska. Additionally, UAF's strategic plan (http://www.uaf.edu/strategic/) for implementing the mission statement states that one goal is to devote resources to economic development of Alaska. The PEOs directly address not only the relevancy to Alaska, but also the objective of preparing engineers for the mineral and energy industries; additionally, they implement UAF's goal of economic development. Most of our program graduates have joined Alaska's mineral industry, a key driver of the state's economy. Other aspects of the institutional mission such as lifelong learning, academic excellence, and student success are embedded in the different student outcomes that help.

D. Program Constituencies

The constituents of the program are:

- Mining engineering students: Current full-time and part-time students.
- Employers: Companies that have either hired graduates of the program or have the potential to hire them.
- Alumni of the program: Graduates of the program.

The faculty serve the constituents and, therefore, do not consider themselves as constituents of the program.

E. Process for Revision of the Program Educational Objectives

The current PEOs have their origin in the PEOs developed for the 2005 ABET visit. Following the visit, it was decided to amend the PEOs to make them more measurable, an important step given the concern over assessment. The new PEOs were then vetted by the Advisory Board of the program and by the constituents.

Program Educational Objectives are reviewed periodically by the faculty to make sure they are current and reflect the needs of the constituents. The most recent amendment was in 2010; it was vetted by the Advisory Board, alumni (see 2010 survey results later in this chapter), and students (see Appendix J).

CRITERION 3. STUDENT OUTCOMES

A. Student Outcomes

Except for Outcome L, student outcomes are identical to those required by ABET, and are defined in Table 3-1.

Table 3-1: The Mining Engineering Program Outcomes

Item	Outcomes
A	An ability to apply knowledge of mathematics, science and engineering.
B	An ability to design and conduct experiments, as well as to analyze and interpret data.
C	An ability to design a system, component, or process to meet desired needs within realistic constrains such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
D	An ability to function on multidisciplinary teams.
E	An ability to identify, formulate, and solve engineering problems.
F	An understanding of professional and ethical responsibility.
G	An ability to communicate effectively.
H	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
I	A recognition of the need for and an ability to engage in lifelong learning.
J	A knowledge of contemporary issues.
K	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
L	A knowledge of unique engineering and environmental issues in the arctic and subarctic regions.

The student outcomes documentation is discussed in Criterion 4, Section B2.

B. Relationship of Student Outcomes to Program Educational Objectives

The matrix that relates program outcomes to PEOs are given in Table 3-2.

Table 3-2: Relationship Between PEOs and Program Outcomes

Program Educational Objective	Program Outcome
To graduate competent engineers who will be employed in the mineral and energy industries	A through L
To graduate competent engineers who will be solving problems germane to Alaska	J, L
To graduate competent engineers who will be professional and understand the need to stay technically current	F, I

Program Outcomes A–K are attributes of a competent engineer; otherwise, the EAC of ABET would not require them. Therefore, Outcomes A–K are expected in all mining engineers, Alaskan or not. Outcome L, which focuses on the environmental and engineering challenges of the Arctic, is an essential attribute for a mining engineer to be employed in Alaska. Therefore, Outcomes A–L are essential for mining engineers to be competent and employable in Alaska or elsewhere (PEO#1). While the same is true for a mining engineer in solving problems germane to Alaska, knowledge of engineering and environmental issues of the Arctic and knowledge of contemporary issues are especially essential for them to solve Alaska-specific problems. Therefore, J and L help achieve PEO#2. The third PEO is achieved by graduates being responsible professionals (Outcome F) who are committed to lifelong learning (Outcome I).

The table that follows shows the contribution of the various courses to different outcomes. In most cases, outcomes assessment was based on upper-level courses.

Mining Engineering Course Outcomes and Assessment Criteria

Out-come	MIN 103	MIN 104	MIN 202	MIN 225	MIN 226	MIN 301	MIN 302	MIN 313	MIN 370	MIN 407	MIN 408	MIN 409	MIN 443	MIN 454	MIN 482	MIN 484	MIN 489	MIN 490	Other experience
A			X	X				X	X		X								
B				X			X		X			X							
C						X	X								X			X	
D											X						X	X	
E					X	X		X					X	X		X			
F		X	X															X	
G										X	X						X	X	
H	X									X									X[1]
I																			X[2]
J	X									X									X[1]
K			X					X	X			X	X		X				
L						X	X							X		X			

A. An ability to apply knowledge of mathematics, science and engineering;

B. An ability to design and conduct experiments, as well as to analyze and interpret data;

C. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, health and safety, manufacturability, and sustainability;

D. An ability to function on multi-disciplinary teams;

E. An ability to identify, formulate, and solve engineering problems;

F. An understanding of professional and ethical responsibility;

G. An ability to communicate effectively;

H. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context;

I. A recognition of the need for, and an ability to engage in life-long learning;

J. A knowledge of contemporary issues;

K. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice;

L. A knowledge of unique engineering and environmental issues in arctic and subarctic regions.

Note on Other Experiences: 1. SME Student Chapter activities, field trips, and/or conference participations

2. Training/certifications after graduation: Registration as P.E., continued education at jobs, etc.

CRITERION 4. CONTINUOUS IMPROVEMENT

A. Program Educational Objectives

Table 4-1 describes the assessment tools used to measure achievement of the PEOs. Since PEOs can only be measured several years past graduation, the main tools are the alumni and employer surveys. **However, since the program has only a handful of graduates, it was recognized that the main tools could be skewed. Therefore, each educational objective was also assessed using a "secondary" tool.** A secondary tool is one that serves as a building block for the PEOs or is an early indicator for the achievement of the PEO.

Table 4-1: Tools to Assess Program Educational Objectives

Program Educational Objectives	Assessment Tools
To graduate competent engineers who will be employed in the mineral and energy industries	▪ Alumni survey ▪ Employer survey Secondary tool ▪ Job placement ▪ Feedback on Senior Design Project ▪ FE exam pass rate
To graduate competent engineers who will be solving problems germane to Alaska	▪ Alumni survey ▪ Employer survey Secondary tool ▪ Job placement ▪ Feedback on Senior Design Project
To graduate competent engineers who will be professional and understand the need to stay technically current	▪ Alumni survey Secondary tool ▪ Extracurricular activities such as participation in professional societies, conferences etc

Each year, data are gathered using the secondary tools, except for the UAF Program Review, which is conducted by UAF every five years. The main tools—alumni and employer surveys—are used once about every five years. Given the low number of graduates, conducting alumni and employer surveys more frequently than that does not yield actionable information. The educational objectives are evaluated each year using current/historical assessment data.

In addition to the data gathering just described, the Advisory Board of the program meets annually to review the program.

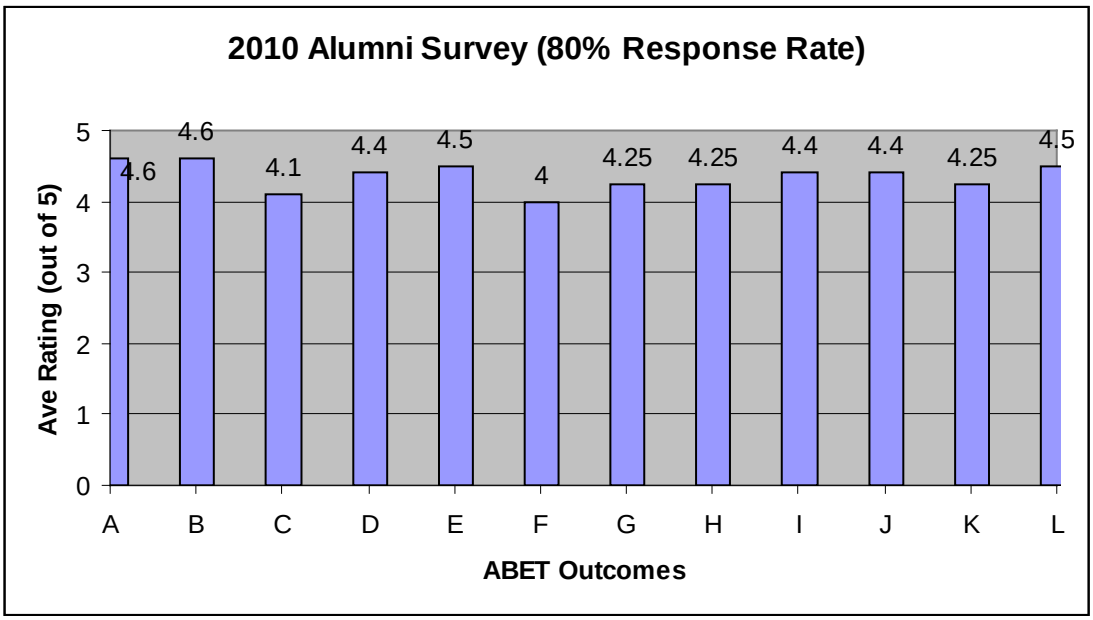
F.1. Evaluation of the PEO, "To graduate competent engineers who will be employed in the mineral and energy industries"

The evaluation based on the various assessment tools are as follows:

Alumni Survey: An online survey was conducted in the summer of 2010 of alumni from the years 2005 through 2009. The population for this period was 10. The total number of responses received were 8, resulting in an 80% response rate. See Appendix E-1 for the survey and the responses.

Respondents had graduated from 2005, 2006, 2007, and 2009, with one unspecified. Two respondents were working at a coal mine in Alaska, and two, in a metal mine in Alaska. One respondent was a transportation engineer with the State of Alaska, one was in the mine permitting agency of the state, one was an independent miner, and one (female) was a homemaker (after working as a mining engineer for 2–3 years). Thus, program graduates were gainfully employed in the mineral and energy industries immediately upon graduation, indicating that the PEO was met.

All respondents thought that the defined PEOs were appropriate. All respondents also thought that the PEOs were met with them. Therefore, it is not surprising that the respondents also rated the achievement of ABET objectives very highly, as shown in the following chart.



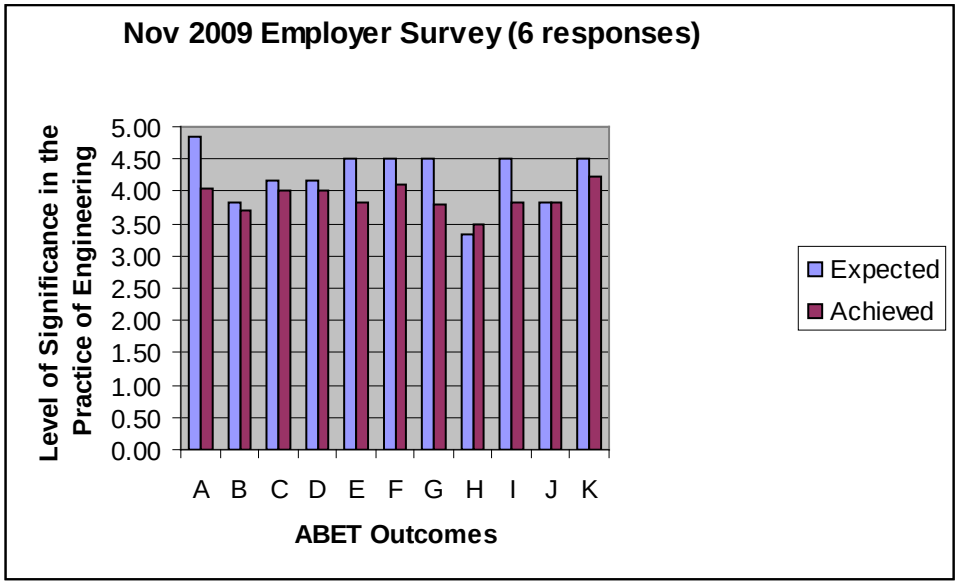
Note that the PEOs in the alumni survey had slightly different wording. The wording was changed a few months after the survey, following the recommendation of an ABET consultant that visited Fairbanks in October 2010. When this change in wording was brought up at the Advisory Board meeting in November 2010, the Board felt (see minutes of Board meeting in

Appendix J) that, since the intent of the PEOs had not changed, there was no need to repeat the survey.

Employer Surveys: A survey (see Appendix E-2) was sent out in November 2009 to employers of our alumni. Six responses were obtained. This response rate may seem very small, but given that the program had ten graduates and five distinct employers in the five-year period (2005–2009), the response rate was very good.

Four employers responded about the nature of their business. All four were in the mining business (hard rock mine, coal mine, or industrial mineral), confirming that program graduates do indeed work in the mineral industry (PEO#1).

Employers were asked to identify the extent to which each of the outcomes was required for the jobs performed by program alumni; they were also asked to rate how well they thought program alumni had achieved those outcomes. Only ABET Outcomes A–K were surveyed. In a critical omission, Outcome L was unfortunately left out of the survey. As seen in the following chart, program graduates were rated at a level above "average" in all outcomes, though not at a level required for their jobs. This rating is not surprising, because the program only prepares its graduates for entering the profession and not for mastering it.

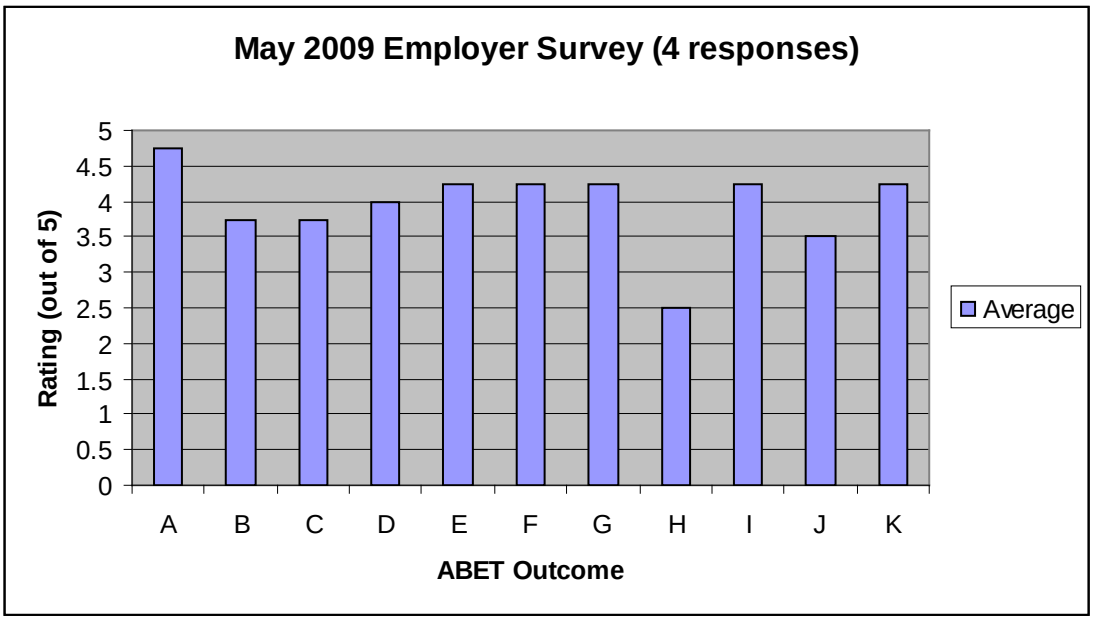


The employer survey measured student outcomes, not PEOs. However, these outcomes were measured a few years after the student graduated. Since the outcomes help achieve the PEOs, the survey was an alternate measure of the achievement of PEOs.

Survey takers were also asked if program graduates were on par with graduates from other universities. Employers had a good opinion of our graduates, with two of them rating program graduates as superior to graduates from other universities; four employers rated them on par.

Another survey was done of employers present during the senior mine design project presentation at an Alaska Miners Association (AMA) meeting in May 2009. The four

employers who took the survey had hired our alumni in the past, and rated the A–K outcomes very highly, as shown in the next chart. The individuals who took the survey were different from the six individuals who took the later (November 2009) survey, though some may have represented the same employers.



Without the homogeneity in the responses, it would have been difficult to arrive at any sound conclusions, given the small number of responses. However, given the consistency of the responses, it is not a stretch to conclude that the PEO of graduating competent engineers who are prepared for the mineral and energy industries is being met.

This conclusion is because:

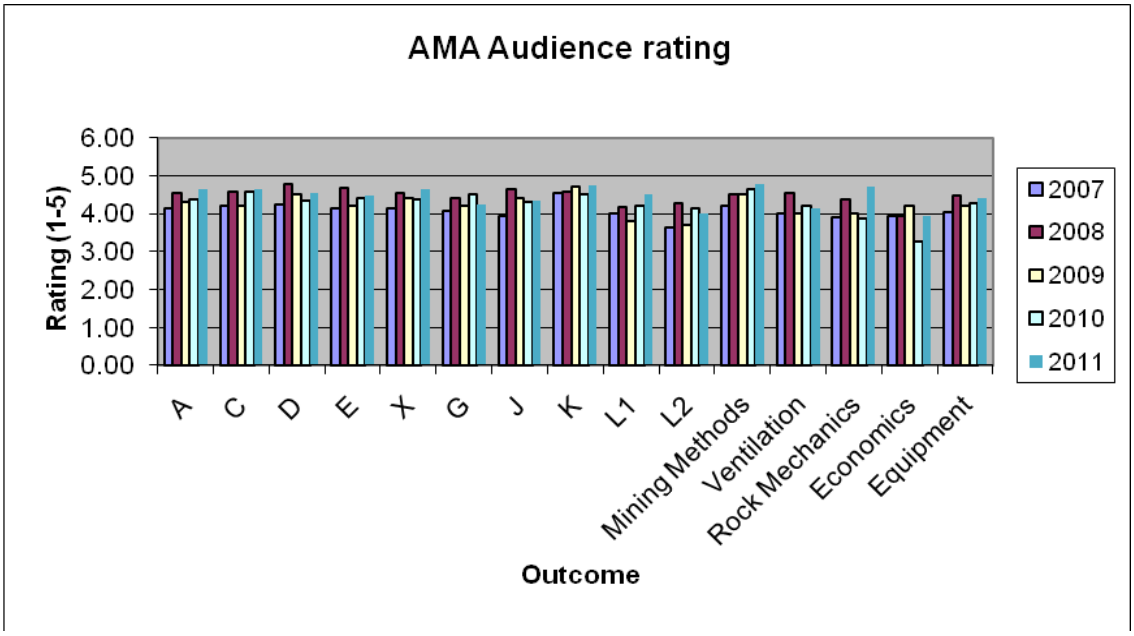
- Alumni unanimously think that the PEO was met.
- There is consistency with which student outcomes were rated as being achieved (by alumni and employers) at the average levels or higher.
- Employers think program graduates are at least on par with graduates from other universities.
- The Advisory Board agreed with the above conclusions in the November 2010 meeting in Anchorage (Appendix J).

Secondary assessment tools also point to the PEO being met, and they include:

Placement: The program has had a 100% placement rate for its graduates for a long time. Additionally, all our graduates have been placed in engineering capacities, and though the program cannot control graduates' choice of employer, most graduates have worked for mineral and energy industries in Alaska and beyond. Employers in the last few years were in Alaska (such as Pogo mine, Fort Knox mine, Usibelli Coal Mine, Rock Creek mine, and Kensington mine) and elsewhere (Freeport McMoran, Arizona, BHP Billiton, New Mexico, and Newmont, Nevada), and were a mix of mineral and energy companies. Of these employers,

all indicated that program graduates are competent engineers who are prepared for employment in the mineral and energy industries in temperate and arctic regions; otherwise, they would not have been hired and placement would not be 100%.

Feedback on Senior Design: Mining engineering seniors are required to present their design project to an audience of Alaska Miners Association (AMA) members. Since the design project is typically the culmination of their academic training, AMA audience rating is a good indicator of the quality of program graduates. Appendix F shows the AMA Audience Survey form. The following chart shows audience ratings since 2007.



In this chart, Outcome X was "proficiency in mining engineering topics," while Outcomes L1 (knowledge of mining engineering in arctic and subarctic conditions) and L2 (knowledge of environmental issues of the Arctic) were two parts of the current Outcome L (knowledge of unique engineering and environmental issues in arctic and subarctic regions). The other outcomes—A, C, D, E, G, J, and K—are as defined by ABET. The sample size varied between 10 and 20 in any given year. The chart shows that the AMA audience thought highly of the skill levels of the senior students, except for "economics" in 2010. There was only one graduating senior in 2010; therefore, some topics including economics were not covered in depth in his design project, resulting in an audience rating of 3.25 for "economics."

The annual presentation of senior design projects at AMA meetings has been a blessing for the program and has served as an advertisement. In perhaps the biggest endorsement of the program's quality, since the first presentation of the senior design project at AMA in 2007, some companies have approached the program to let the senior students do the pre-feasibility mine design for their projects. Independent reviewers, such as Tim Arnold, then VP/GM of Kensington mine, who had provided data for the 2008 project, called the 2008 project "very accurate" (Appendix G).

FE Exam Pass Rate: Students are required to take the FE exam prior to graduation. However, there is no requirement to pass the exam, thereby, resulting in questionable motivation on the part of the student for passing the exam. Additionally, the exam does not test students in basics of mining engineering. Given these, the FE exam may not be the best indicator of basic engineering competency, though it could be utilized to compare Mining Engineering graduates from UAF with mining engineering graduates from other universities (even though it is possible others may be more motivated if they are required to pass the exam). The FE exam pass rate for Mining Engineering majors is 77% for the 2006–2011 time period, compared with 67% nationally. Thus, the FE exam pass rate indicates that program graduates have a broad engineering competency similar to their peers.

Year	Number Taking FE	Number Passing
2006	3	2
2007	1	1
2008	3	2
2009	1	1
2010	2	1
2011	3	3
Total	13	10
	Pass rate	77%

F.2. Evaluation of the PEO, "To graduate competent engineers who will be solving problems germane to Alaska"

The evaluation based on the various assessment tools are as follows:

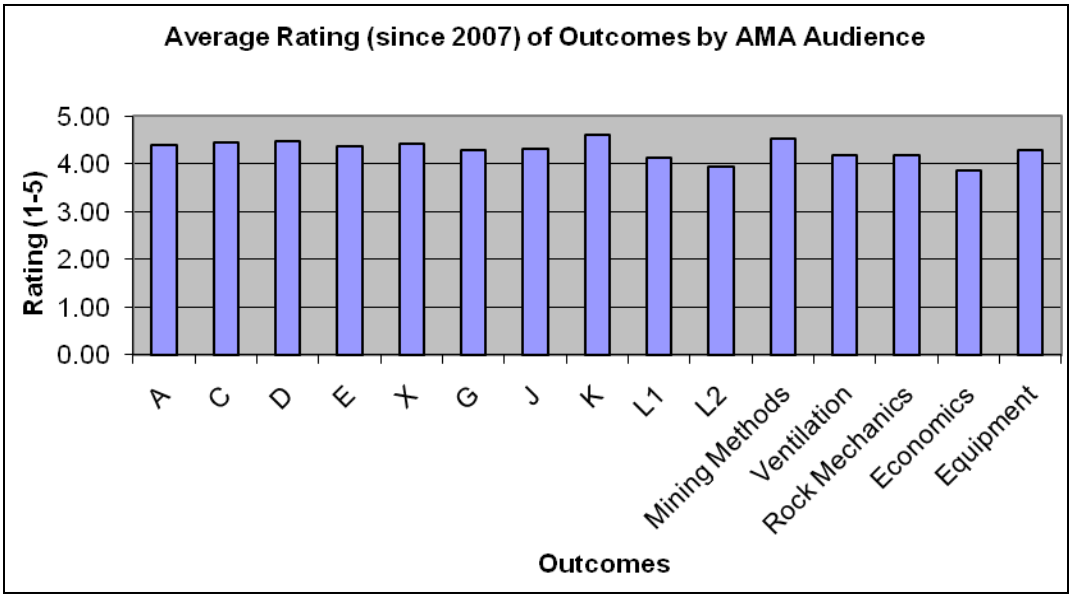
Alumni (2010) and Employer (2009) Surveys: The alumni survey of 2010 asked alumni to identify skills that were critical to performing their jobs. The employer survey of November 2009 also asked employers to identify skills that were essential for alumni to perform their jobs. The skills that were identified (see Appendix E for actual responses), soft skills (including oral and written communication), computer skills and mining engineering (such as ground control, ventilation, blasting, planning/design, surveying), are all emphasized in the curricula, implying that the program imparts skills that are germane to those needed in Alaska. Also relevant to the PEO are what was presented in the previous section: (1) alumni thought the PEO was met for them, and (2) employers thought program graduates had adequate competencies in A–K outcomes, and they deemed graduates on par with their peers (graduates of other universities).

Thus, the alumni and employer surveys indicate that program graduates are competent and prepared to solve problems germane to Alaska.

Other indicators of successfully meeting the PEO are:

Placement: As presented in the discussion on placement in the previous section, most of our recent graduates have placed in the mining industry in Alaska. This fact is an external validation of our program, because it implies that Alaska employers think that our graduates can solve problems germane to Alaska. These employers would not hire program graduates if they felt otherwise.

Feedback on Senior Design: As presented in Section F.1 and the following chart, the AMA audience rated Outcomes L1 (knowledge of mining engineering in the arctic and subarctic conditions) and L2 (knowledge of environmental issues of the arctic)—both specific to Alaska—highly, at almost 4 every year since 2007. This high rating was in addition to the high ratings of the other outcomes.



F.3. Evaluation of the PEO, "To graduate competent engineers who will be professional and understand the need to stay technically current"

The evaluation based on the various assessment tools are as follows:

Alumni Survey: The 2010 alumni survey revealed some very encouraging information. Seven out of eight respondents had professional certifications such as Professional Engineer, Engineer in Training, or other (such as blaster's certification). Six respondents also had attended job-related short courses or training since graduation, with four stating they had attended multiple training/short courses. Six respondents had been to at least one conference since graduation, with four stating they attended a conference at least once every year. These survey results imply that program alumni are professional and understand the need to stay technically current.

Secondary tools also points to the PEO being met.

Extracurricular activities such as participation in professional societies, conferences, etc.: Students in the Mining Engineering program are strongly encouraged to attend professional meetings such as SME Student Chapter, SME Annual Meeting, and the Alaska Miners Association conference. Thus, the 2009–2010 SME Student Chapter meetings saw an average *undergraduate* attendance of 12 (records were not kept previously), and 16 in 2010–2011. The

student chapter also came in second in the SME student membership recruitment-drive contest worldwide (2009–2010). It is not surprising then that many freshmen and sophomores attend the meetings, not just seniors and juniors. Additionally, five undergraduate students attended the 2011 SME Annual Meeting, with nine in 2010 and six in 2009. Considering the distance to where SME Annual Meetings are held, this attendance is impressive. Note that e*very student attends at least one SME annual meeting prior to graduation*. This attendance level may be because the department (partially) sponsors five to ten students to attend the SME Annual Meeting. Over ten students also attended the Alaska Miners Association conferences in Anchorage (2009) and Fairbanks (2010). In a survey of the SME student chapter in February 2011, 70% of the respondents (out of 18 responses) indicated they had attended an AMA conference, while 60% indicated they had attended a SME Annual Meeting. To put this in perspective, only 55% of the survey takers were juniors or seniors. The students demonstrate their belief in lifelong learning and broad education: about 40% said they had been to three to five mining conferences.

All students who go to the conferences express gratitude and appreciation for the learning and networking opportunity. As seen in the 2011 survey of the SME student chapter, all (100%) thought that conferences were useful for one's professional development and that they would try to attend conferences after graduation to stay current in the field.

Thus, the survey and student chapter data reveal that the program has been successful in laying the seed for the program educational objective to be met.

B. Student Outcomes

Mining engineering faculty assess the program annually. A whole range of accreditation issues are discussed including program outcomes. Outcomes-related discussion revolves around:

- Achievement of individual outcomes
- Appropriateness of performance indicators for each outcome
- Review of outcomes matrix; i.e., Are the courses listed in the matrix the most appropriate places to measure a given outcome?
- Relevancy and the need for "optional" outcomes. These are outcomes not required by ABET and used by programs to highlight their uniqueness.
- Data management issues including individual responsibilities

Annual reviews have resulted in changes to outcomes matrix, performance indicators, and definition of optional outcomes. During the 2005 visit, the program had two optional outcomes:

- Knowledge of engineering for arctic and subarctic conditions.
- Knowledge of unique environmental issues in arctic and subarctic regions.

However, the two outcomes have been merged into one, since environmental and engineering aspects of the Arctic are related and, therefore, difficult to separate.

B1. Achievement of the Outcomes

Faculty evaluate student learning in their courses at the end of every semester, and evaluate achievement of program outcomes at the end of every academic year. The course and program outcomes assessment system has been in place for several years, though it has continued to evolve. The most recent changes included development of outcomes evaluation rubrics in 2009, following Dr. Rajive Ganguli's attendance at an ABET symposium on assessment in April 2009. Rubrics were developed for achievement of outcomes, both at the program level and at the course level. These rubrics utilize a variety of direct and indirect assessment tools including student work and pre/post-course surveys. The evaluation team will be provided these rubrics as evidence of outcomes achievement.

The program uses three levels of achievement to assess outcomes: proficient, apprentice, and deficient. An outcome is not met if it is achieved at the deficient level. Proficiency is the most desired level of achievement and is achieved in many students. However, it requires students to make a sincere effort, in addition to proper course design and instruction.

The table at the end of Section B2 summarizes achievement of each of the 12 outcomes (A–L). For details, see the documentation.

B2. Documentation

Student outcomes documents are displayed in two different ways:

- In the first (and primary way), separate folders have been created for each outcome for display. Thus, there are 12 folders (A–L). Each folder contains a summary of the assessment (including performance indicators), followed by examples of student work for each of the performance indicators for the outcome. These folders will explicitly demonstrate that the 12 outcomes are being met. As a sample, Appendix I shows the summary of assessments for Outcome K and evaluation of MIN 482.
- Folders have also been created for courses for display. These folders contain course-specific information such as syllabus, teaching material, assessment, and examples of student work. These folders will be useful in examining how each course was assessed and how improvements were made.

As an example, suppose the evaluator wishes to review documentation of achievement of Outcome K. The evaluator would open the folder labeled "K" and immediately see the summary sheet for the outcome. The summary sheet lists the performance indicators, the assessment methods/data used, and the assessment language. The reviewer can then view samples of student work organized by performance indicators.

A reviewer wishing to explore a certain course in detail (or if the assessment refers to improvements made in a course) could look in the course folder for detailed information. The course folder would contain the syllabus, assessment rubrics, assessment summary, and samples of student work, organized by outcomes.

Out-come	Comments	Closing the loop	
		Actions Taken	Improvements Seen
A	The performance criteria demonstrate that students that successfully complete the courses are able to apply engineering science and mathematics to solve mining engineering problems at the apprentice level. However, student background in engineering science and mathematics has prevented many from achieving the outcome at the proficient level.	Increased review of engineering science and mathematics in MIN 202, 313 & 370. Increased use of examples in class.	This action has been effective in MIN 202 and 370, where outcomes are now being achieved at a higher level than 2008.
B	This outcome was achieved at the proficient level in 2010 by all students in MIN 302 and 409. In MIN 370, the outcome would have been achieved at that level if it were not for the fact that some students demonstrated the ability to interpret experiment data only at the apprentice level.	Increase homework that requires interpretation of experiment data.	This action has been effective in MIN 370, where outcomes are now being achieved at a higher level than 2009.
C	This outcome is being met at the proficient level in the capstone design course (MIN 490). However, there is room for improvement because in other courses (MIN 301, 302 and 482) as it is being met at the apprentice level only. Student interest in a topic appears to motivate them to excellence, while lack of academic preparation appears to negatively impact their performance.	MIN 301: Increase course prep time to include innovations in controls and automation. MIN 302: Impose pre-requisite and increase time spent on design MIN 482: Require justification of design.	New requirements imposed in 2008, following assessment in 2007, helped expose issues in MIN 482. Following assessment in 2008, rubrics were further fine tuned in 2009. Thus, in 2009, block modeling and reserve estimation were identified as being met only at apprentice level. These topics were emphasized in 2010.
D	This outcome is now being met at the proficient level. Student groups are able to achieve a common goal, distribute work evenly and communicate with each other effectively.	Team communication was a problem in MIN 490 in 2007. Therefore, documentation requirement was increased.	Increased documentation made students communicate with each other more. Therefore, team communication was not a problem thereafter.
E	This outcome is met at the apprentice level or higher. Reasons for not achieving the outcome at the proficient level include i) lack of academic preparation in math & engineering science (MIN 313 & 443), and mining engineering foundation (MIN 454) and ii) student motivation (MIN 313)	Mining engineering curriculum was redesigned to address the mining engineering foundation issue. It is not clear if lack of academic preparation is the sole reason for reduced achievements in MIN 313 & 443. Additionally, most students are performing at the proficient level in these courses. Therefore, no action has been recommended.	Assessment reveals that outcomes are being met.

Out-come	Comments	Closing the loop	
		Actions Taken	Improvements Seen
F	Understanding of professional and ethical responsibilities is imparted into students very early on, starting with MIN 104. However, program review by faculty in 2008 revealed that this outcome was not properly assessed. Therefore, assessment methods were improved to better assess the outcome.	Outcome emphasized and assessed in MIN 202; new writing requirement imposed in MIN 490, especially a section on ethical reflections; data being collected on student participation in professional activities	Emphasis on professionalism and ethics has improved the level of achievement of the outcome in MIN 202 and MIN 490. It has also increased student enthusiasm for participation in professional society activities. Data collection has allowed student enthusiasm about their profession to be measured.
G	Direct assessment of student work in MIN 408, 489 & 490 and indirect assessment by AMA audience reveals that program graduates are able to effectively communicate prior to graduating. However, this was not always the case. There were problems with both oral and written communication, such as inadequate writing quality and rushed presentations.	The definition of writing quality improved in 2008 and 2009, with specifications on style, grammar standards, formatting, units, figures, tables and references. Starting 2008, oral presentations in MIN 490 were required to be reviewed by the instructor several days before the actual presentation. Students are also required to attend a guest lecture on oral presentation.	Writing quality has improved noticeably. Establishment of writing standards has improved the professionalism. Oral presentations are now consistently professional.
H	The two course work based performance criteria demonstrate that all mining engineering students have the broad education necessary to understand the various impacts of mining engineering. Extra curricular activities such as attendance at conferences and field trips to mines outside of Alaska demonstrate that students are exposed to broader aspects of the mining industry.	The faculty decided to expose students to the broader mining industry sometime in the mid-2000s. This vision was implemented by dedicating annual proceeds from the Stampede funds to partially sponsor student development activities.	Student participation in the SME Annual Meeting, AMA conferences, and visits to mines outside of Alaska, have significantly increased in the past five years, thereby exposing students to broader aspects of the mining industry. This was confirmed in a survey in 2011 when a vast majority of respondents said that program sponsored extra curricular activities helped broaden their education.
I	The performance criteria show the student interest in life long learning begins early on and is demonstrated through attendance in SME Student Chapter meetings. The high success rate in the FE exam, following by successfully obtaining professional certification, program graduates have demonstrated the ability to learn independently. Results of the 2010 alumni survey show that program graduates continue to attend training and short courses, therefore, demonstrating this outcome.	This outcome was not measured very well in alumni. Therefore, the alumni survey was re-designed in 2010 to directly measure this outcome.	The 2010 survey provided information on continuing education activities of program graduates, thereby, improving outcome evaluation. A survey of current students in 2011 confirmed that the seeds of appreciation for lifelong learning was sown during their education; 83% said they would try to attend conferences and short courses during their professional careers.

Out-come	Comments	Closing the loop	
		Actions Taken	Improvements Seen
J	Students have demonstrated knowledge of contemporary issues early and late in the curriculum. Program sponsored extracurricular activities also expose them to contemporary issues in the mining industry.	No action needed	Assessment reveals that outcomes are being met.
K	A review of student work across the curriculum reveals that they have the modern skills, spanning a variety of areas such as mine surveying, computer aided mine design and rock mechanics, necessary to enter the workplace.	Rubrics were developed to better assess computer aided mine design. Survey equipment was purchased, and an additional lab section was added, to increase student time on instrument.	Student proficiency in computer aided mine design has continued to improve. Rubrics have allowed instruction to be fine tuned. Student time on instruments has gone up in the mine surveying lab following the changes.
L	Most students had demonstrated their mastering of the knowledge of the unique engineering and environmental issues in arctic and subarctic regions. Classroom teaching, homework, design projects and laboratory experimental exercises have provided an in-depth and systematic study of this knowledge. Most students' knowledge in this field was above Apprentice level.	Outcome L can be further improved by including more updated information on recently-initiated high-latitude mining operations, adding more case study examples and assigning an additional design project on mine ventilation systems under arctic and subarctic conditions.	Assessment reveals that outcomes are being met.

C. Continuous Improvement

Information from the following are utilized to assess the program:

- Annual faculty review
  - Every aspect of the program is reviewed – curricula and outcomes, student academic preparation, state of laboratories, etc.
- Individual course assessment
  - Done by individual faculty member. Any broad concerns are brought to the attention of the entire faculty.
- Stakeholder input
  - Advisory Board feedback
  - Alumni and employer surveys
  - Exit interviews with graduates

The major changes that have occurred in the program following program assessment:

- The 3-credit capstone design course, MIN 490W, was split into two parts, MIN 489W (1 credit, Fall semester) and MIN 490W (2 credits, Spring semester) in 2006–2007.

  Rationale: The program faculty prefer that the capstone design be done using real data as much as possible. Unfortunately, real data are difficult to get despite promises from external sources (exploration and mining companies). This resulted in delays and compromised the quality of design. Students and faculty were both frustrated and, therefore, the program decided to follow some of the other accredited mining engineering programs that spread their capstone design course over two semesters.

  Results: This has had the desired impact. Students now have more time to collect data, prepare the data sets (most data sets require pre-processing), plan the design work, and even do preliminary design work. This action has significantly improved the quality of the final product.

- Move MIN 482: Computer-Aided Mine Design from Spring to Fall semester (starting 2007–2008)

  Rationale: After the change to the capstone design course was made, it was realized that benefits would increase if students had the VULCAN skills to do preliminary design work. Starting the work early helps expose data issues, which if known early, can be addressed without impacting the final product. Since the VULCAN course was offered during Spring semester, it was decided to offer it during Fall semester. Students would now take the course concurrently with MIN 489W.

  Impact: The change had a positive impact because students learned how to develop a drill hole database within the first month of the semester, while drill hole data were still arriving from private sources. However, it was felt that it would be more

beneficial if students were completely comfortable with VULCAN prior to taking the capstone design courses.

- Advise students to take MIN 482: Computer-Aided Mine Design in the junior year (starting 2008–2009)

  Rationale: As noted previously, the faculty realized that students should be trained in VULCAN prior to starting their capstone design. Additionally, it was felt that if students knew VULCAN in the Fall semester of their junior year, VULCAN could be more embedded into other courses. However, embedding VULCAN into other courses would require that other faculty also be trained in VULCAN. Therefore, all faculty of Mining Engineering underwent 40 hours of VULCAN training in 2009.

  Impact: This change had a significant impact on the capstone design course. Orebody modeling is now typically completed (or significantly advanced) within MIN 489W, rather than being done as part of MIN 490W, which has allowed students to add depth or breadth to their design in MIN 490W.

- Mining Engineering curriculum re-design (2010–2011)

  Rationale: Two issues kept coming up each year in annual program reviews by Mining Engineering faculty: irrelevance of ES 201: Computer Techniques (according to student exit surveys) and insufficient student preparation in quantitative methods and mine development (faculty review).

  - In ES 201, students learned how to program in two different languages. However, current and graduating students felt that these skills were not helpful in their academic work, and did not see them as useful in their careers.

  - Mine development and basic quantitative methods were taught in MIN 106 (1 credit) and MIN 206 (1 credit). However, it was observed in senior-level mining classes that students were not adequately trained in these topics.

  The faculty decided to eliminate MIN 106, MIN 206, and ES 201 from the curriculum, thereby freeing up five credits. Two new courses were created: one on quantitative methods (MIN 225, 2 credits) and one on mine development (MIN 226, 2 credits). One credit was also added to MIN 407W: Mine Reclamation & Environmental Management to increase it to 3 credits.

  Impact: Cannot be assessed until 2012–2013.

- Enhancement to courses

  Rationale: Every course is assessed by the faculty member at the end of the semester. Often, this assessment results in changes in content or student assignments. There are too many instances of such changes to be fully detailed here. Therefore, the evaluator is invited to inspect individual course folders.

  Impact: See Section B2 for a summary and displayed course folders for details.

- Other changes

  The program embraces the spirit of continuous improvement of quality. However, this process was not documented very well before Spring 2009. See Appendix H for a log of the various actions taken by the program. See Appendix K for minutes of faculty meetings and Appendix L for exit interviews with graduates of the program for the past several years.

D. Additional Information

CRITERION 5. CURRICULUM

A. Program Curriculum

The Curriculum: Components, term-by-term schedule

The Mining Engineering curriculum has the following components (also see Table 5-1):

1. Mathematics and Basic Sciences (Total 37 credits)

The mathematics component of the curriculum requires 15 credits of course work including Calculus I, II, and III and Differential Equations. It provides a solid foundation of mathematical knowledge. Additionally, students are exposed to basic statistics and quantitative methods in MIN 225 and MIN 409. The basic science requirement includes 22 credits of course work including general college chemistry (8 credits), general college physics (8 credits and calculus-based), and geological science (6 credits). Both the general chemistry and the general physics include a full year of laboratory experience. Each of the two geological science courses also includes a laboratory session for one semester, equivalent to a one full year of laboratory experience as well.

2. General Education (Total 28 credits)

The general degree requirements at UAF require that all students complete 9 credits of communication, 18 credits of humanities and social sciences (called "Perspectives of the Human Conditions" or PHC) and 1 credit of library science. The 9 credits of communication include 3 credits of an oral communication course and 6 credits of written communication courses. In addition to the 27 credits, students are also required to complete 6 credits of "W" courses and three credits of "O" courses. "W" courses are writing intensive, while "O" courses are oral communication intensive. In the Mining Engineering curriculum, MIN 407W (3), MIN 489W (1) and MIN 490W (2) provide the "W" component, while MIN 408O (3) provides the "O" component. The 18 credits of "perspectives" provide for a broad education, and course selections include appreciation of fine arts, societies and culture, history, ethics, and foreign languages. The two pathways for completing the 18 credits of PHC are as follows:

Pathway 1: Complete 18 credits by satisfying option a, b and c below.

a) Complete all of the following four courses:

- ANTH F100X/SOC F100X—Individual, Society and Culture (3)
- ECON F100X or PS F100X—Political Economy (3)
- HIST F100X—Modern World History (3)
- ENGL/FL F200X—World Literature (3) 12

b) Complete one of the following three courses:

- ART/MUS/THR F200X—Aesthetic Appreciation: Interrelationship of Art, Drama and Music (3)
- HUM F201X—Unity in the Arts (3)
- ANS F202X—Aesthetic Appreciation of Alaskan Native Performance (3) 3

c) Complete one of the following six courses:

- BA F323X—Business Ethics (3)
- COMM F300X—Communicating Ethics (3)
- JUST F300X—Ethics and Justice (3)
- NRM F303X—Environmental Ethics and Actions (3)
- PS F300X—Ethics and Society (3)
- PHIL F322X—Ethics (3) 3

Pathway 2: Complete 12 credits from the above courses plus one of the following:

- Two semester-length courses in a single Alaska Native language or other non-English language
- Three semester-length courses (9 credits) in American Sign Language taken at the university level. 6 - 9

3. Engineering Sciences (Total 17 credits)

The engineering science courses stress fundamental engineering sciences in mechanics, thermodynamics, electric engineering, and fluid mechanics. These courses allow students to have a good understanding of general engineering principals and to develop a solid foundation for more specific mining engineering courses. One of the engineering science courses, ES 341—Fluid Mechanics, has a strong laboratory component, providing students with opportunities for hands-on practice and skill development.

4. Mining Engineering and Related Courses (Total 50 credits)

A total of 44 Mining Engineering credits, 3 credits of elective, and a 3-credit Geological Engineering course, GE 261—General Geology for Engineers offered in the same department, are required of Mining Engineering students, making the total Mining Engineering and related course credits 50. The Mining Engineering courses are divided such that students gain knowledge and experience in various aspects of mining engineering, from mining safety, mining operations, mine surveying, rock mechanics to surface and underground mining, rock fragmentation, mine environmental engineering, mineral economics, and computer-aided mine design. The integration of various aspects of mining engineering knowledge and experience that students gain through the Mining Engineering curriculum is reflected in the capstone design course.

Table 5-1 Curriculum

Mining Engineering

Course (Department, Number, Title) List all courses in the program by term starting with first term of first year and ending with the last term of the final year.		Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[2]	*Curricular Area (Credit Hours)*				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Average Section Enrollment for the Last Two Terms the Course was Offered[1]
			Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
1st Year Fall Semester	MIN 103- Introduction to Mining Engineering	R		1 ( )			Fall 2009&2010	13
	MIN 104- Mining Safety and Operations Lab	R		1 ( )			Fall 2009&2010	13
	ENGL111X - Introduction to Academic Writing	R		( )	3		F 2010& S-2011	24
	MATH 200X – Calculus	R	4	( )			F 2010& S-2011	20
	CHEM 105X – General Chemistry	R	4	( )			F 2010& S-2011	95(Lect)/13(Lab)
	Perspectives on the Human Condition	SE		( )	3		F 2010& S-2011	25 – 50[3]
	LS 100X /101X Library & Information	R		( )	1		F 2010& S-2011	50
1st Year Spring Semester	COMM 131X or 141X - Fundamentals of Oral Comm.	SE		( )	3		F 2010& S-2011	23
	MATH 201X - Calculus	R	4	( )			F 2010& S-2011	33
	GE 261 – General Geology for Engineers	R		3 ( )			S 2010& S-2011	22
	CHEM 106X – General Chemistry	R	4	( )			F 2010& S-2011	110 (Lect) /16 (Lab)
	Perspectives on the Human Condition	SE			3		F 2010& S-2011	25 – 50[3]
2nd Year Fall Semester	MATH 202X – Calculus	R	4	( )			F 2010& S-2011	20
	MIN 202 - Mine Surveying	R		3 ( )			Fall 2009&2010	12
	MIN 225 – Quantitative Methods	R		2 ( )			*TBA*[4]	TBA
	PHYS 211X - General Physics	R	4	( )			F 2010& S-2011	75(Lect)/15(Lab)
	GEOS 262- Rocks and Minerals	R	3	( )			F 2008 & 2010	20

Course (Department, Number, Title) List all courses in the program by term starting with first term of first year and ending with the last term of the final year.		Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[2]	*Curricular Area (Credit Hours)*				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Average Section Enrollment for the Last Two Terms the Course was Offered[1]
			Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
2nd Year Spring Semester	MIN 226 – Mine Development	R		2 ( )			To be offered[4]	
	PHYS 212X - General Physics	R	4	( )			F2010&S2011	70(Lect)/15(Lab)
	ES 208 – Mechanics	R		4 ( )			F2010&S2011	20
	GEOS 332- Ore Deposits and Structure	R	3	( )			S2010 & S2011	10
	ENGL 211X or 213X - Academic Writing	SE		( )	3		F2010&S2011	22
3rd Year Fall Semester	ES 331 – Mechanics of Materials	R		3 ( )			F2010&S2011	24
	MIN 313[5]- Introduction to Mineral Preparation or MIN 407W[5]- Mine Reclamation and Environmental Management	R		3 (✓)			F2007&F2009 / F2010&2008	4 / 4
	MIN 482 – Computer Aided Mine Design – VULCAN	R		3 (✓)			F2009&F2010	5
	Perspective on the Human Condition	R		( )	3		F2010&S2011	25 – 50[3]
	ES 307- Elements of Electrical Engineering	R		3 ( )			F2010&F2009	40
	ES 346- Basic Thermodynamics	R		3 ( )			F2010&S2011	40
3rd Year Spring Semester	ES 341 - Fluid Mechanics	R		4 ( )			F2010&S2011	42(Lect)/9(Lab)
	MIN 301- Mine Plant Design	R		3 (✓)			S2010&S2011	6
	MIN 302- Underground Mine Environmental Engineering	R		3 (✓)			S2010&S2011	3
	MIN 370 - Rock Mechanics	R		3 (✓)			S2010&S2011	15
	MATH 302 - Differential Equations	SE	3	( )			F2010&S2011	30

Course (Department, Number, Title) List all courses in the program by term starting with first term of first year and ending with the last term of the final year.		Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[2]	*Curricular Area (Credit Hours)*				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Average Section Enrollment for the Last Two Terms the Course was Offered[1]
			Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
4th Year Fall Semester	MIN 443- Principles and Applications of Industrial Explosives	R		3 (✓)			F2010&F2008	4
	MIN 454 - Underground Mining Methods	R		3 (✓)			F2010&F2009	2
	MIN489W- Mining Design Project	R		1 (✓)			F2010&F2009	2
	MIN 313[5]- Introduction to Mineral Preparation or MIN 407W[5]- Mine Reclamation and Environmental Management	R		3 (✓)			F2007&F2009 / F2010&2008	4 / 4
	Perspectives on the Human Condition	SE		( )	6		F2010&S2011	25 – 50[3]
4th Year Spring Semester	MIN 408O- Mineral Valuation and Economics	R		3 ( )			S2011&S2010	7
	MIN409- Operations Research	R		3 (✓)			S2011&S2010	5
	MIN 484- Surface Mining Methods	R		2 (✓)			S2011&S2010	4
	MIN490W- Mining Design Project	R		2 (✓)			S2011&S2010	3
	MIN 485- Mining Engineering Exit Exam	R		0 ( )			S2011&S2010	2
	Technical Elective	SE		3 (✓)			N/A[6]	
	Perspectives on the Human Condition	SE		( )	3			

Course (Department, Number, Title) List all courses in the program by term starting with first term of first year and ending with the last term of the final year.	Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE.[2]	*Curricular Area (Credit Hours)*				Last Two Terms the Course was Offered: Year and, Semester, or Quarter	Average Section Enrollment for the Last Two Terms the Course was Offered[1]
		Math & Basic Sciences	Engineering Topics Check if Contains Significant Design (√)	General Education	Other		
TOTALS-ABET BASIC-LEVEL REQUIREMENTS		37 hrs	67 hrs	28 hrs			
OVERALL TOTAL CREDIT HOURS FOR THE DEGREE	132 hr						
PERCENT OF TOTAL		28%	51%	21%			
Total must satisfy either credit hours or percentage — Minimum Semester Credit Hours		32 Hours	48 Hours				
Total must satisfy either credit hours or percentage — Minimum Percentage		25%	37.5 %				

1. For courses that include multiple elements (lecture, laboratory, recitation, etc.), indicate the average enrollment in each element.
2. Required courses are required of all students in the program, elective courses are optional for students, and selected electives are courses where students must take one or more courses from a specified group.
3. Depends on the exact class in the cluster.
4. New course.
5. MIN 313 & 407W are offered alternate years.
6. Technical electives can be a wide variety of courses and section sizes can vary accordingly, from low single digits in MIN courses to close to 50 in civil engineering courses.

Relationship of Program Curriculum to PEO

The Mining Engineering curriculum is designed to meet the program educational objectives as shown below:

PEO: To graduate competent engineers who will be employed in the mineral and energy industries

The mineral and energy industries require engineers with competencies that span surface and underground mining, and coal and hard rock mining. These include mining methods, mine development, unit processes of mining, rock mechanics/ground control, ventilation, mineral preparation, computer-aided mine design, safety, blasting, surveying, economics, and mine reclamation. Each of these areas is covered in the curriculum. However, students also need a good grasp of the fundamental processes that govern the engineering aspects of these industries. Therefore, course work includes mathematics, physics and chemistry, mechanics, thermodynamics, fluid mechanics, and elements of electrical engineering. Competent engineers also need good soft skills, components of which are the ability to communicate effectively, and a broad mind. Communication (oral and written) skills are developed through many courses from freshmen level to senior level, while a broad mind is imparted through broad course work that includes history, society and culture, literature, art/music/theater appreciation, and ethics.

Thus, all 132 credits are devoted to this PEO.

PEO: To graduate competent engineers who will be solving problems germane to Alaska

The entire curriculum described previously is important to solve Alaska's problems. However, courses that impart knowledge of the engineering and environmental issues of the Arctic are especially applicable to Alaska rather than elsewhere. These topics are covered in the introductory Mining Engineering course (MIN 103), and courses in unit processes (MIN 301), ventilation (MIN 302), mining methods (MIN 454 and MIN 484), and reclamation (MIN 407W), for a total of 15 credits.

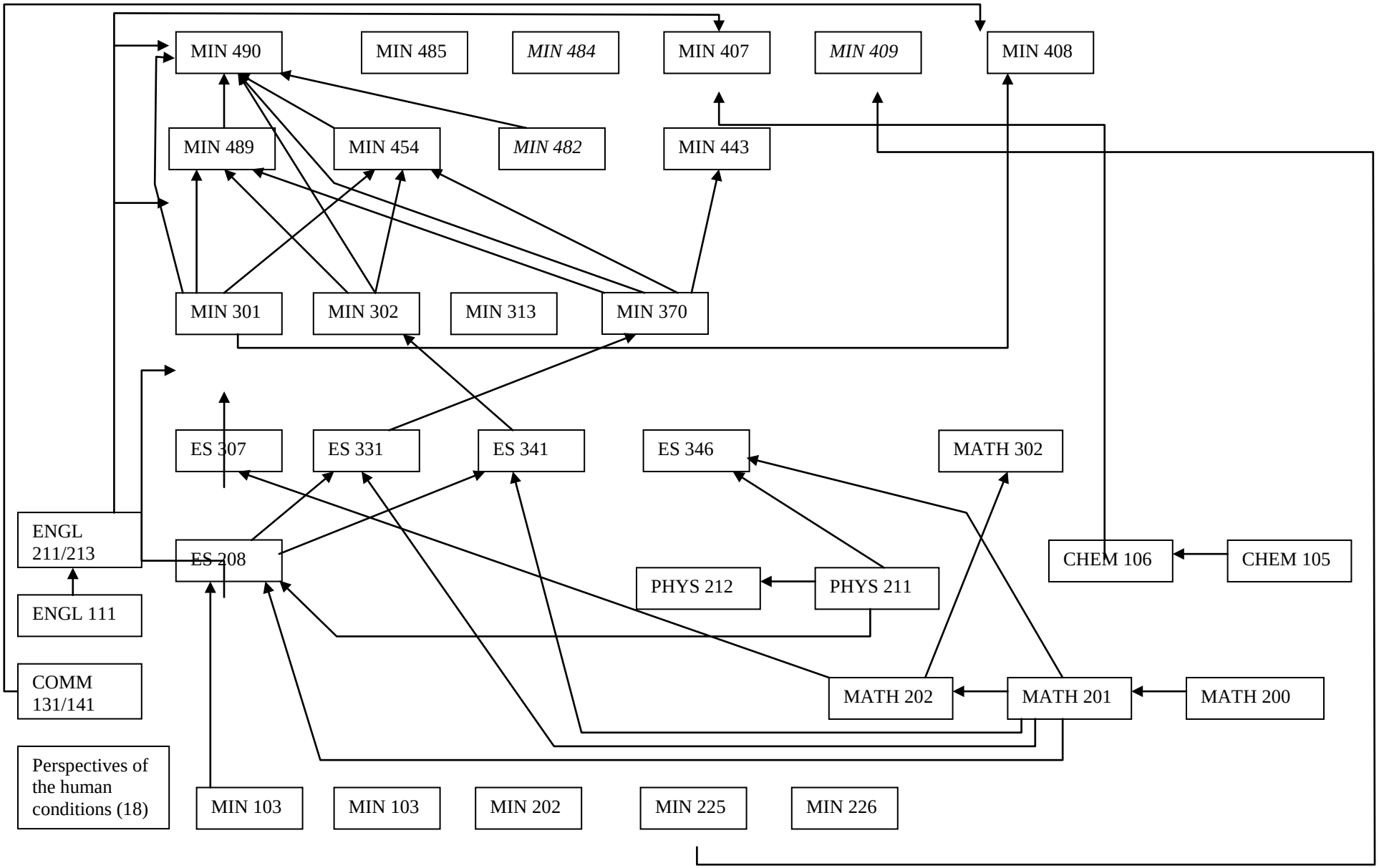
PEO: To graduate competent engineers who will be professional and understand the need to stay technically current

The importance of understanding professionalism and the need to stay technically current is covered in all Mining Engineering courses, though it is particularly stressed in mine safety, surveying and senior design (6 credits). These courses introduce students to standards expected of professional engineers. Extracurricular activities, such as participation in professional societies, exposes students to many professionals and, therefore, to the benefits of being one, and to the benefits of staying technically current.

Prerequisite Flowchart

The flowchart in Figure 5-1 shows the prerequisites for the various courses.

Figure 5-1: Prerequisite Flow Chart (class standing restrictions are shown in *italics*).



Major Design Experience Incorporating Engineering Standards and Multiple Constraints

Students typically design a mine for their capstone design project. Components of design include orebody (or seam) modeling, block modeling, 3D mine design, equipment selection ventilation design (for underground mine), rock mechanics and ground control, blast design, reclamation, processing flow sheet, arctic engineering, and economics. Additionally, the design must be communicated in written and oral form. Thus, the capstone project requires students to apply skills, knowledge, and abilities from previous course work, spanning a wide variety of engineering and non-engineering topics.

The faculty prefer that students work with real-life data as much as possible. However, no source (exploration or mining company) provides all data that are necessary, so projects typically mix real and assumed data. Thus, all design projects have significant amounts of real-life constraints in them. Constraints are also sometimes artificially imposed to make the project challenging. This is especially true of the location. A drill hole dataset from the Lower 48 may be "moved" to Alaska to impose arctic challenges. Example projects based on actual data include Wishbone Hill surface coal mine and Kensington underground gold mine ("Downward Spiral").

Since the capstone design experience is a group project, each student picks aspects of the mine that suits his/her skills and interest. The experience culminates in an oral presentation at an AMA meeting and a final report. The audience also fills out a survey about the senior design project.

Course material for review

The following items will be available for review by evaluators: course syllabi, teaching materials, and example of student work including tests and homework.

B. Course Syllabi

See Appendix A for course syllabi.

CRITERION 6. FACULTY

Faculty responsibilities, evaluation criteria, and workload are governed by three documents in order of increasing standing:

1. Faculty Senate policies (www.uaf.edu/uafgov/faculty-senate).
2. UAF Faculty Appointment and Evaluation Policies and UAF Regulations for the Appointment and Evaluation of Faculty (known as "Policies" and "Regulations," and collectively as the "Blue Book"), found at: www.uaf.edu/provost/promotion-tenure.
3. United Academics Collective Bargaining Agreement (unitedacademics.net).

A. Faculty Qualifications

The Mining Engineering faculty, dedicated to the Mining Engineering program, consists of three full professors (Drs. Sukumar Bandopadhyay, Gang Chen, and Rajive Ganguli) and one assistant professor (Dr. Sabry Sabour). All have an undergraduate degree in mining engineering (or equivalent), and an earned doctorate in mining engineering or a related field. All are also registered Professional Engineers in the State of Alaska or elsewhere. Additional credentials include Second Class Mine Manager's Certificate from India (Dr. Sukumar Bandopadhyay) and Mine Foreman, Alabama (Dr. Rajive Ganguli). Notable awards among faculty include SME's Ivan B. Rahn Education Award and Howard Eavenson Coal Research Award (Dr. Sukumar Bandopadhyay), SME's Robert Peele Memorial Award (Dr. Rajive Ganguli), State of Alabama's Flame Safety Lamp Award (Dr. Rajive Ganguli), and Honorary Professor of Hebei University (Dr. Gang Chen). In addition to these faculty, two Mineral Industry Research Laboratory faculty (Professors Dan Walsh and Steve Lin) contribute to the program. These additional faculty also have excellent credentials such as Professional Registrations and/or international awards (Professors Walsh and Lin are two-time winners of SME's Arthur Taggart Award). See Table 6-1 for faculty qualifications and Appendix B for faculty vitae.

B. Faculty Workload

A full-time faculty workload is 30 units for 9 months, as defined in the United Academics Collective Bargaining Agreement (UNAC CBA, unitedacademics.net). A typical tripartite faculty workload would consist of 60% teaching, 30% research, and 10% service (18, 9, and 3 workload units, respectively). Teaching credit consists of formal instructional classes, advising undergraduate students, mentoring graduate students, etc. Research activities include all professional activities leading to publication, performance, or formal presentation in the unit member's field, or leading to external funding recognizing the unit member's current or potential contribution to their field. Such activities include manuscript submission, grant proposal submission, supervision of externally funded research projects, development of patentable inventions, additions to a portfolio, and other contributions appropriate to the unit member's field. Service activities include professional service, public service, and university service. Typically, a faculty member serves on some committee within the department, college, or university. A 3-credit class is worth 3 workload units. A typical workload consists of four 3-credit courses per year, graduate student supervision, undergraduate student advising, research activities, and service activities in all three service categories.

The composition of professional duties and responsibilities of unit members is determined by the appropriate administrator after consultation with the department head/chair and unit member. Faculty members consult the department chair in writing their proposed workload (www.uaf.edu/provost/faculty-reports-forms/faculty-workload-forms), who then submits workloads to the dean, who modifies the proposals if necessary to achieve the overall balance of required work of the college. It is possible to buy out of a course (3 units of workload for 6 weeks of salary) using research funding or internal competitive grants, provided the academic mission of the college can still be effectively delivered.

See Table 6-2 for Faculty Workload summary for 2011–2012.

C. Faculty Size

The faculty size dedicated to the Mining Engineering program is four, and just enough to deliver the Mining Engineering program. Therefore, faculty absences, such as those caused by sabbaticals or departures, can be challenging.

The Mining Engineering faculty-to-student ratio is about 1:8, allowing for very close interaction with students. Faculty are generally familiar with most students' academic and personal histories, making advising very effective. All Mining Engineering faculty are also well engaged with professional societies and the mining industry, making them good mentors to the students. The Program Review conducted by UAF in 2007 (all academic programs are reviewed every five years) highlighted student satisfaction with faculty interactions as a strength of the program.

Faculty are engaged with the university, community and the profession through service. Examples of service done by Mining Engineering faculty in the last five years includes Co-Chair of the U.S. Rock Mechanics Symposium (2005), editorial boards of journals (*Mining Engineering*, *World Journal of Engineering*), Member of Advisory Committee to NIOSH, Member of Advisory Committee of Golden Valley Electric Association, and UAF Faculty Senator.

Table 6-1. Faculty Qualifications

Mining Engineering

Faculty Name	Highest Degree Earned- Field and Year	Rank [1]	Type of Academic Appointment[2]	FT or PT[4]	Years of Experience			Professional Registration/ Certification	Level of Activity[3] H, M, or L		
					Govt./Ind. Practice	Teaching	This Institution		Professional Organizations	Professional Development	Consulting/summer work in industry
Dr. Sukumar Bandopadhyay	PhD-Mining Engineering	P	T	FT	5	30	29	Prof. Engr. (AK), Second Class Mines Manager (India)	H	H	L
Dr. Gang Chen	PhD-Mining Engineering	P	T	FT		24	17	Prof. Engr. (AK)	H	H	L
Dr. Rajive Ganguli	PhD-Mining Engineering	P	T	FT	3.5	11	11	Prof.Engineer (AK), Mine Foreman (AL)	H	H	L
Dr. Sabry Sabour	PhD-Mineral Economics	AST	TT	FT	1	14	1	Prof.Engineer (Canada)	M	H	L
Prof. Dan Walsh[5]	MS-Mineral Preparation Engineering	P	T	FT	5	27	30	Prof. Engr (AK)	H	H	H (non-pay)
Dr. Steve Lin[5]	PhD-Metallurgy	P	T	FT	1	26	25		H	H	H (non-pay)

1. Code: P = Professor ASC = Associate Professor AST = Assistant Professor I = Instructor A = Adjunct O = Other

2. Code: TT = Tenure Track T = Tenured NTT = Non Tenure Track

3. The level of activity, high, medium, or low, reflects an average over the year prior to the visit plus the two previous years.

4. At the institution

5. Mineral Industry Research Lab faculty

Table 6-2. Faculty Workload Summary (2011–2012)

Mining Engineering

Faculty Member (name)	PT or FT[1]	Classes Taught (Course No./Credit Hrs.) Term and Year[2]	Program Activity Distribution[3]			% of Time Devoted to the Program[5]
			Teaching	Research or Scholar-ship	Other[4]	
Dr. Sukumar Bandopadhyay	FT	MIN F103 Introduction to Mining Engineering, 1 cr, Fall 2011 MIN F225 Quantitative Methods in Mining, 2 cr, Fall 2011 MIN F637 Mine Systems Simulation, 3 Cr, Fall 2011 MIN F302 Underground Mine Environmental Engineering, 3 cr, Spr 2012; MIN F409 Operations Research and Computer Applications, 3 cr, Spr 2012 MIN F688 Graduate Seminar, 1 cr, Spr 2012	60	33	7	100
Dr. Gang Chen	FT	MIN F104 Mining Safety and Operations Laboratory, 1 cr, Fall 2011 MIN F443 Principles and Applications of Industrial Explosives, 3 cr; Fall 2011 ES 208 Mechanics, 4 cr, Fall 2011 MIN F370 Rock Mechanics, 3 cr, Spring 2012 MIN F301 Mine Plant Design, 3 cr, Spring 2012	67	23	10	100
Dr. Rajive Ganguli	FT	MIN F454 Underground Mining Methods, 3 cr; Fall 2010 MIN F380/F482/F682 Computer-Aided Mine Design-VULCAN, 3 cr; Fall 2010 MIN F489 Mining Design Project I, 1 cr; Fall 2010 MIN F490 W Mining Design Project II, 2 cr; Spring 2011	47	33	20	100
Dr. Sabry Sabour	FT	MIN F202 Mine Surveying, 3 cr; Fall 2011 MIN F621 Advanced Mineral Economics, 3 cr, Fall 2011 MIN F408 O Mineral Valuation and Economics, 3 cr, Spring 2012 MIN F484 Surface Mining Methods, 2 cr; Spring 2012	57	30	13	100
Prof. Dan Walsh	FT	MIN 313 Intro to Mineral Preparation, 3 cr, Fall 2011	37	26	37	0

NOTE: Dr. HK Lin (0% dedicated to program) will not be teaching any MIN classes in 2011–2012

1. FT = Full Time Faculty or PT = Part Time Faculty, at the institution.
2. The academic year for which the self-study is being prepared.
3. Program activity distribution should be in percent of effort in the program and should total 100%.
4. Indicate sabbatical leave, etc., under "Other."
5. Out of the total time employed at the institution.

D. Professional Development

The Office of Faculty Development, located at 222 Bunnell Building, provides professional development opportunities for all faculty members at UAF in the areas of teaching, learning, and scholarship. Assistance with travel, mentoring, promotion and tenure, teaching observations, and instructional technology (through Campus Technology Services) are some of the programs. The office also brings national speakers and trainers to campus, conducts training workshops, and maintains a collection of resource materials on these topics, both in the office and at the Rasmuson Library. Regular workshops, panel discussions, and seminars are held throughout the year for faculty. Although these events are mainly designed for new faculty, they are open to all faculty members, and can be audio-conferenced to the rural campuses if requested. The limited travel funds are generally awarded competitively to new faculty.

Training in other areas such as classroom technology, safety, and ethics are also provided through different UAF departments. CEM provides limited funding (competitively) to faculty for professional development activities (PDA).

In general, while there are many on-campus training opportunities, PDA such as attending mining industry conferences and short courses can be difficult due to systematic lack of funding and high travel costs from Alaska. However, faculty have been able to maintain professional development activities through a mix of CEM travel awards, external grants, department money released from research buyouts, and collegial generosity.

E. Authority and Responsibility of Faculty

Program faculty have control over course content, including creation, modification, and evaluation of courses and program requirements. Program requirements, including creating, deleting, and changing courses, are typically initiated following annual program assessment by faculty. However, course creations and modifications have to be approved by the department chair, CEM Curriculum Council, CEM Dean, Curriculum Council of the Faculty Senate, and the Provost. Every signatory technically has the same responsibility—ensuring that course proposals minimize content overlap, have resources for effective delivery, have a sound teaching and assessment plan, and are compliant with Faculty Senate guidelines. However, some signatories emphasize certain aspects more than others. The department chair ensures that the course is consistent with the mission of the program and department, and that resources (faculty, lab, etc.) exist to deliver the course effectively. The CEM Curriculum Council ensures that no course duplication occurs within the college and looks at the expected rigor of the course, including contact hours versus credit hours and level of material matching the course number, and ensures that all required content is present and clear on the proposed syllabus, etc. The CEM Dean offers guidance in curriculum development to both the department and Curriculum Council regarding realistic constraints of course enrollment numbers, department faculty capacity, number of courses in the degree program, etc., and must agree with the proposal in order for it to move forward. The Curriculum Council of the Faculty Senate examines course proposals in the context of the entire university for duplication, and ensures compliance with Faculty Senate and university-wide guidelines on course content, syllabus content, and assessment.

College faculty examine, modify, and vote on approval of the CEM Unit Criteria, which are the published guidelines used in the evaluation of CEM faculty during the promotion and tenure process (http://www.uaf.edu/files/provost/CEM-unit-criteria-5-1-06.pdf). These Unit Criteria must be approved by CEM faculty at least every five years. Change can be initiated by CEM faculty at any time, but changes are subject to approval by vote of the faculty. The same Unit Criteria are used in pre-tenure (mandatory 4th year evaluations) and post-tenure evaluations of faculty. Unit Criteria are additional to the criteria outlined in the UAF "Blue Book" polices and regulations.

CRITERION 7. FACILITIES

A. Offices, Classrooms and Laboratories

The university provides basic infrastructure such as classrooms, office space, library facilities, common computer areas, and high speed internet connections within campus. The William Elmhirst Duckering Building, located on campus, was completed in 1964, with a large addition constructed in 1984. In early 2002, after more than a year of extensive renovations, the Duckering Building was rededicated and today it serves as home to the College of Engineering and Mines, including classrooms and lab space. The building is home to all seven engineering programs and four different research units under INE. Given the recent enrollment trends and growing research activities, space is becoming a big issue. Computer Science is currently housed on the second floor of the Sydney Chapman Building, with space for offices, labs, computational facilities, and classrooms.

About 55 general purpose classrooms are scheduled by UAF Academic Scheduling in the Registrar's Office. Most engineering classes are taught in the Duckering Building, where there are nine general purpose classrooms controlled by Academic Scheduling, with a total classroom area of 6568 ft^2. These nine classrooms are all classified as "smart" classrooms in that they have LCD projectors with laptop/tablet computer connections. Some classrooms have additional equipment such as a CD/DVD player, VTR player, dedicated computer, wired internet connections, video digitizer, audio mixer and amplifier, and speakers for any presentation modality. Wi-Fi internet connectivity is present throughout the Duckering Building. White boards are used in all classrooms. A couple of "Smart Carts," which include a computer with wireless internet connectivity and an LCD projector on a mobile cart, are available.

Additionally, many departments have instructional laboratories that are dedicated to specific purposes. A fair number of department courses are taught in these instructional laboratories, and most of them are equipped with "smart" technology. Several conference rooms are available in the Duckering Building, and these are equipped with "smart" technology, including Tandberg videoconferencing capability in some cases.

The office space dedicated to the Mining Engineering program includes offices for the office manager (shared with the Geological Engineering program) and for the four faculty, and a department conference room. Teaching assistants are provided space through a central CEM-wide TA office space pool. The Mining Engineering program is provided with one and a half teaching assistants every year.

The Mining Engineering laboratories, important to delivering program outcomes, are mine surveying, mineral preparation, rock mechanics, mine ventilation, and computer-aided mine design (see Table 7-1 for a listing of all labs used by the students). Additionally, either the Delta Mine Training Center or the Silver Fox Mine is used to provide mine safety training. While all laboratories are sufficiently equipped, there are space challenges. The mine surveying laboratory currently has less than 90 square feet dedicated to it, making it a challenge to mobilize prior to a lab session and to store expensive equipment. The mineral preparation laboratory is spread out over multiple buildings, presenting logistical challenges. The Silver Fox Mine, which was finally rehabilitated in 2009 from the roof collapse several years ago, has been a wonderful training

laboratory for the program. However, the mine has been historically very expensive to rehabilitate and maintain. The two modern computer laboratories controlled by the program have been instrumental in delivering the 3D Mine Design aspects of the program. The department and CEM invested heavily in the DUCK 310 computer laboratory in 2010 (and in DUCK 318 in 2009) to ensure effective teaching of computationally intensive courses.

B. Computing Resources

The program has access to three computer laboratories every hour of the day: the department computer laboratory (DUCK 310), the Mine Design laboratory (DUCK 318), and the SOECAL (Students of Engineering Computer Applications Lab) laboratory (DUCK 530/532). Each of these laboratories has modern computers and basic software such as MS Office. Additionally, the Mine Design laboratory and the department computer laboratory, both of which are controlled by the department, have specialized software including VULCAN, RockWare, Costmine, Isatis, NeuroShell, and Matlab. Computational resources in terms of hardware, software, and licenses are adequate. The SOECAL lab is configured in a teaching configuration with an instructor computer station, an LCD projector, a whiteboard, and 26 student computer stations. Some engineering courses are scheduled in Duckering 530, including the sophomore-level Computer Techniques course, and other courses use the computing lab for special lectures, such as when a particular software package is demonstrated. When the computing lab is not used for a class, it is open to all engineering students. Duckering 532 is an open computer lab with 18 student computer stations. All stations in both labs are well equipped with engineering software including Matlab, Cadence, Advanced Design System, CAMWorks, SolidWorks, LabVIEW, as well as standard word processing and graphing software. Both rooms have 24-hour key card access. Security for the lab is provided by the key card-activated door lock and a video surveillance system.

In addition to the three laboratories, students and faculty have access to several campus-wide laboratories and technologies such as:

- Assistive technology lab for disabled students. The lab has numerous specially equipped computers. Lab staff also help students and faculty create website accessible to disabled persons.
- The Blackboard system that hosts online content for courses that are suitable for both synchronous and asynchronous teaching. Features of the system include ability to post teaching material in a variety of formats, testing, discussion boards, live whiteboard and chatroom, and course management tools.
- Three general computing labs, Bunnell Student Access Lab, MBS Student Access Lab (24 Hour, in a student dorm), and Rasmuson Student Access Lab (24 Hour).
- An instructional computing lab in the Rasmuson library
- Campus-wide wireless access for laptops

TABLE 7-1

LABORATORY FACILITIES

MINING ENGINEERING PROGRAM

Laboratory	Functions of Laboratory	Courses Taught	Physical Location	Area (ft^2)
Coal Preparation Lab	Coal analysis, coal petrology, washability analysis and others	MIN415	Agricultural Bldg & 484 Duckering Bldg.	2300
Mineral Preparation Engineering Lab	Crushing, grinding, sizing classification, wet gravity concentration and others	MIN313	Agricultural Bldg & 484 Duckering Bldg.	2300
Mine Design Lab	Computer-aided mine design	MIN481, MIN482 & MIN490W	318 Duckering Building	292
Mine Surveying Lab	Storage of various surveying equipment	MIN202	356 Duckering Building	90*
Mine Ventilation Lab	Ventilation experiments and simulations	MIN302	302 Duckering Building	1018
Rock Mechanics Lab	Rock mechanics testing and experiments	MIN370, MIN472 & MIN443	149A Duckering Building	427
Rock Drilling and Core Preparation Lab	Drilling tests and experiments and rock sample preparation	MIN370, MIN472 & MIN443	141 Duckering Building	598
Computer Lab	A multipurpose lab used by all students of the department	Various MIN & GE courses	310 Duckering Building	481
General Geology for Engineers Laboratory	Mineral and rock identification, topographic and geologic map reading, and air photo interpretation	GE261	314 Duckering Building	439
Silver Fox mine	A mine that provides opportunity for some basic mining skills	MIN 104, MIN 202 and others	Elliott Highway	N/A

*: Space allocated to survey lab

- Supercomputing center, though it is rarely used for teaching. Program faculty use it more for research, the required FBI security checks prior to getting an account making it very difficult to utilize it in class. Recent developments (steep cuts in funding) make its use very uncertain in the future.

C. Guidance

Faculty and staff are available to guide students as they utilize various resources. Faculty train students in specialized software and equipment, such as VULCAN mine design software, or operation of the loading machine in the rock mechanics lab. Additionally, UAF rules require online internal safety training (provided for free) for hazardous activities such as handling chemicals in labs. In line with the above, students are required to have passed MIN 104 before they can independently work in the Silver Fox mine (they are also required to follow safety processes specially drafted for the mine). Technical staff are also available to provide help on basic skills such as computing, email, etc.

D. Maintenance and Upgrading of Facilities

The laboratory needs of the program are discussed annually in department faculty meetings. These discussions result in equipment acquisition and maintenance requests. The department chair works with the CEM Dean to get these requests funded. UAF and CEM have annual programs for funding of laboratory upgrades. The program has seen significant investments in its laboratories in the recent past such as:

- $7,000 on rock mechanics lab in 2011.
- $65,000 in 2010 for survey lab equipment. An additional $1,500 in maintenance in 2011.
- $25,000 in 2010 for computer lab upgrades.
- $3,000 on general geology lab in 2010.
- Over $90,000 (2008–2011) in Silver Fox mine (not including significant in-kind support from external supporters).

To ensure consistency in laboratory maintenance, laboratory fees have either been imposed or increased (starting Fall 2010) in most of the laboratory-based courses. While laboratory maintenance is not ideal, it is certainly sufficient.

E. Library Services

The Rasmuson Library website, www.uaf.edu/library, provides detailed information about departments, services, and collections within the Rasmuson Library; it also provides access to information through its online catalog (Goldmine). The entire system catalog can be searched by author, title, subject, or other search methods using library.uaf.edu/goldmine. This site can be

accessed by students, faculty, and the public. Current journal subscriptions and e-journals licensed for UAF use are available through the Journal List web page, also accessed through the Library website.

Goldmine can be used to locate not only what is owned by the Rasmuson Library but also what is owned by all the sites in the University of Alaska statewide system. For example, the Interlibrary Loan page provides information on how to obtain books, photocopies, or audiovisual materials that are not available on campus from other library locations, how long it takes, renewals, general policies, Web Document Delivery, how to access an online request form, and more. In addition, a wide variety of subject-specific databases is available in the library via the Elmernet local area network (only searchable in the library), and via the Internet to UAF students, faculty, and staff. On-campus users may access all resources listed on the library website from any campus public, office, or dorm room computer. Off-campus use of licensed e-resources (with the exception of the "Databases for Alaskans" collection) is restricted to UAF faculty, students, and staff, and requires that UAF users log in using their UAF computer ID and password.

The library currently subscribes to more than 130 electronic databases including online indexes, full-text journal article collections, e-books, and encyclopedias. Some of the database searches available to UAF students, faculty, and staff are listed in the table that follows this section. Additional resources are frequently added to the library website, including article indexes and collections, alphabetical or subject lists for the most current listings, and access to information resources available online.

As part of UAF's core curriculum, undergraduate students must demonstrate their library proficiency either by completing LS 101 (Library Information and Research) or by passing a competency exam. In LS 101, students learn about library research using the Internet, and about finding information in a variety of subject areas.

Additionally, librarians and library staff are available to assist students in using library resources and can give guidance on how to best locate research and information resources both in the library and beyond, regardless of format. Assistance can be provided by phone, email, and live chat with a librarian or library staff member.

The Rasmuson Library is the largest in the state, with more than 1.1 million volumes. Special collections include the world-class Alaska and Polar Regions collections, with books, periodicals, archives, manuscripts, historical photographs, oral histories, and maps. A branch of the Rasmuson Library, the Biosciences Library on West Ridge, contains a substantial collection of books and journals. The Geophysical Institute operates the Mather Library to support student, staff, and faculty research needs in the geophysical area. Services provided by the Rasmuson Library include:

- Carrels – Available for graduate students on a first-come/first-served basis.
- Circulation – Information about borrowing books and videos, overdue policies, and one's library account.

- Conference and Meeting Rooms – Reserve rooms within the library.
- Digital Photographic Services – Professional digital imaging services available to the university community and to the public. Offers digital printing and high-resolution scanning.
- Document Delivery – Delivery of book chapters and paper journal articles, scanned and emailed to requester as a .pdf file.
- Interlibrary Loan – Borrow material from other libraries.
- Instruction – Whether a student, faculty, or staff, instruction provided in how to use library resources.
- Media Services – Borrow media equipment such as digital cameras, camcorders, laptops, and more. Popular and reference DVDs and CDs are available for checkout.
- Off-Campus Services – A unit set up to serve rural UAF students and faculty who do not have access to appropriate information resources in their town or village.
- Reference Services – Help provided with your library research.
- Reserves – Reading materials for specified classes.
- Room Scheduling – Reserve rooms for study sessions, group meetings, conferences, and teaching.

The Rasmuson Collection Development Officer periodically polls all faculty on campus concerning program needs for books and/or subscriptions. Here is her most recent email specifically to CEM:

> *Dear College of Engineering faculty and graduate students:*
>
> *With Spring Semester almost over, I know most of you won't be thinking about library collections, but since we remain open and work through the summer months, it's a perfect time for us to acquire whatever books you might need for Fall Semester. We do have funds available for book purchases, and we are right now prioritizing our journal subscription requests as well, so if you have suggestions, please send them to me before you leave campus, if possible. I also welcome any assistance from faculty in weeding the older material out of our collections; we rely on your subject expertise to help us make these decisions.*
>
> *I also wanted to fill you in on one of our latest acquisitions: the Earth and Environmental Sciences set of ebooks from Springer. These will be added to our Goldmine catalog shortly so that you can link directly, and will be hosted on the Springer platform which allows downloading to almost any device, as well as printing and simultaneous user access. This set has more than 1000 books, including multiple disciplines. If you want to glance through the title list here is the URL, choose Earth and Environmental:*
>
> *http://www.springer.com/librarians/e-content/ebooks?SGWID=0-40791-12-377411-0*

This book deal is good for all UA campuses; we hope to do more of these types of UA-statewide purchases in the future, so that faculty and students at all campuses can benefit.

Finally, it has been a banner year for use of the EBL or electronic books system. Use has more than tripled since we began this project several years ago. If you haven't tried EBL books yet, or you'd like me to demonstrate it for a group or individually, I'm happy to do so.

Please let me know if you have any questions, and feel free to stop by any time to share suggestions or concerns. Have a great summer!

Karen Jensen
Collection Development Officer
Rasmuson Library
University of Alaska Fairbanks

The electronic UAF library catalog, called Goldmine (library.uaf.edu/goldmine), is an easy-to-use resource for searches. Electronic Books Online (EBL) provides both short-term loans and auto-purchasing options for ebooks on all topics. Readers may view material online, download to a computer for a limited time, and copy or print a small amount of material from these ebooks. A login is required from both on and off campus. The library director noted the incredibly fast transition to electronic materials from traditional print materials: *"We circulated 34,572 physical books in 2010 while EBL in its first full year of use circulated 33,411 book titles. When combined with the library's other [electronic] book collections – Safari, Psycbooks, Netlibrary, Springer, Elsevier, etc. – we expect to see that the use of digital titles now substantially surpasses the circulation of more typical library materials."*

Available databases include:

Applied Science and Technology Abstracts FirstSearch Database	Engineering, mathematics, physics, and computer technology.
ABI/INFORM Global ABI/INFORM Global Database	Indexing for articles in over 1,200 international business, management, and marketing journals, including many computer science representative trade journals. Beginning in 1970 with some full-text. Current search of "Computer Science" as subject yields 2,506 documents.
ACM Digital Library Core Package ACM Digital Library	Full text collection of every article published by ACM, including over 50 years of archives.

Computer Source EBSCOhost Database	Includes full-text and citations for current trends in high technology, covering topics such as computer science, programming, artificial intelligence, cybernetics, information systems, robotics, and software. Dates back to 1985.
Compendex® Engineering Village 2	Most comprehensive interdisciplinary engineering database in the world. Compendex contains over 8 million records and references over 5,000 international engineering sources including journal, conference, and trade publications. Coverage is from 1969 to present and the database is updated weekly.
IEEE All Societies Package IEEE Xplore	Includes access to abstracts and full-text of IEEE journals, transactions, and magazines published since 1998.
IEEE Core Proceedings IEEE Core Proceedings	Contains core collection of IEEE conferences from 1998 to present.
INSPEC ISI Web of Knowledge	Provides bibliographic information and some full-text from the world's leading scientific and technical literature, covering subjects such as physics, engineering, electronics, computers, and information technology. From 1969 to the present.
Institute of Physics (IOP) Online Journals IOP Journals Online	Access to a variety of full text journals in the area of physics, math, and engineering.
Kluwer Online springeronline.com	Full text journals, primarily in the sciences and social sciences, published by Kluwer Academic Publishers. Currently includes 96 Computer Science journals.
MathSciNet MathSciNet Database	Mathematical reviews on the Web. MathSciNet is a comprehensive database covering the world's mathematical literature since 1940.
NTIS CSA Internet Database Service	Produced by the National Technical Information Service, the NTIS database is the preeminent resource for accessing the latest U.S. government-sponsored research and worldwide scientific, technical, engineering, and business-related information.
Safari Tech Books Online safaribooksonline.com	An online library that provides full-text access to a current collection of 2,622 information technology books.
Science Citation Index Expanded and Web of Science Rasmuson Library-Article Indexes and Collections	Provides access to current and retrospective bibliographic information, author abstracts, and cited references found in the world's leading scholarly science and technical journals.
Science Direct Web Editions Sciencedirect.com	A current awareness service from Elsevier Publishing that provides full-text access to the current year journals in science, technology, and medicine that match UAF's print subscriptions.
Wiley Interscience Enhanced Access Wiley Interscience Home	Access to full text journals. Multidisciplinary coverage.

Overall, the library capabilities are quite adequate for the program.

F. Overall Comments on Facilities

Faculty and staff monitor the safety of facilities, tools, and equipment used to deliver the Mining Engineering program. Safety protocols and standards are developed as necessary. For example, use of the Silver Fox mine is governed by the SFM Safety Plan (developed to be similar to Mine Safety and Health Administration rules). Safety standards are not just followed, but are used as academic content, which is essential to the mining industry. Additionally, the UAF Office of Environmental Health Safety and Risk Management and the Provost's Office have safety standards that must be followed for all university facilities and processes. One of the CEM technicians, Paul Brown, is the Building Safety Officer and examines CEM labs, facilities, and processes to ensure safety compliance. Egress placards are placed throughout the Duckering Building.

CRITERION 8. INSTITUTIONAL SUPPORT

A. Leadership

The program does not have a leader per se. The academic content of the Mining Engineering program is owned and closely monitored by its faculty. The needs and quality of the program are discussed annually by the program faculty. Any concerns that come up are brought to the attention of the department chair. All decisions related to program definition and course content are made jointly, though they have to be approved by the department chair. The program has a coordinator, currently Dr. Rajive Ganguli, whose sole charge is to coordinate the accreditation process. The administration of the program is managed by the department chair, who manages a variety of program-related business including teaching assignments of faculty, course offerings, and financial aspects of the program such as funds for labs, classroom supplies, etc.

The department chair is an elected two-year position. Faculty Senate policy (www.uaf.edu/uafgov/faculty-senate/policies-procedures/department-chair-policy) defines the role of the department chair as follows:

a. The department chair is the administrative and academic officer of the department and as such has the primary responsibility and authority for (1) leadership in developing high-quality academic programs which fulfill department, college, and university objectives; (2) leadership in the implementation of college and university policies and programs at the department level; (3) leadership in developing resource requests and an appropriate departmental budget; and (4) service on the college/school executive committee.

b. The department chair is first a faculty member. The department chair is primarily a teacher-scholar serving as a leader of his/her department colleagues. The department chair is a role model for faculty responsibility.

c. The department chair is responsible for providing mechanisms and processes for members' participation in discussion and decision making within the department. All members of the department should be informed of these mechanisms and processes. Regular meetings should be held for purposes of communicating information, discussing issues, and making decisions on department matters.

d. The department chair is expected to communicate faculty perspectives and concerns to the administration and other segments of the community as appropriate. The department chair is the primary spokesperson the faculty of the department. The department chair also conveys administration views and concerns to the faculty.

The department chair is responsible, either directly or by delegation, for performance of at least the specific duties enumerated below (the duties are not prioritized) which shall be performed in

accordance with the extant collective bargaining agreements on the role and status of department chairs.

A. Academic Programs
1. Initiate, plan, oversee implementation of, and review the preparation and offering of the academic program, after appropriate involvement of members of the department and consultation with the dean.
2. Ensure interdepartmental coordination and cooperation.
3. Take leading role in ensuring academic program quality.
4. Ensure reports are prepared as needed. Ensure that course schedule is prepared in a timely manner.
5. Ensure catalog is current.
6. Supervise departmental office and ensure that files and records are maintained.
7. Inform the dean of departmental and faculty activities. Act as a liaison with the university community.

B. Personnel
1. Coordinate and evaluate professional activities of all members of the department, to include providing guidance to faculty concerning expectations regarding promotion and tenure. Request and obtain faculty activity reports as appropriate to this process.
2. Provide recommendations for appointments, promotion, sabbatical leaves, tenure, and release of faculty after consultation with members of the department.
3. Review and recommend to dean/director workloads as proposed by faculty members.
4. Take lead role in departmental faculty and staff recruitment and retention.
5. Provide for the management and supervision of support staff.
6. Appoint appropriate committees within the department.
7. Facilitate support for faculty teaching, research and service activities.
8. Function as spokesperson and advocate for the department, both within and outside the university community.

C. Students
1. Administer the departmental student advisement program and counsel students.
2. Recruit students in cooperation with other members of the department and the dean.
3. Act on student petitions.
4. Provide for the management of student assistants.
5. Address student concerns as appropriate.

D. Budget, Inventory, Facilities, etc.
1. Initiate resource and budget requests with justifications.
2. Maintain fiscal control of departmental budgets.
3. Ensure upkeep of equipment and facilities assigned to the department

B. Program Budget and Financial Support

The dean determines the budget for the departments, given the funding allocated to the college. Starting with historical data, continuation budgets are developed for each department by adding budget increments, if applicable, to the budget levels from the previous fiscal year. Travel and

equipment categories are not initially funded. Central funding for travel is distributed later to departments and awarded competitively to faculty from the CEM and INE travel programs. The equipment budget is funded centrally through a number of sources. These funds are distributed to departments toward the end of the fiscal year. Any equipment costing less than $5K is classified as a commodity. Student fees in computer labs and other labs are directed to the appropriate department and reinvested in the laboratories. Table 8.B-1 details direct program expenditures over the past five years. In addition to the expenditures shown in Table 8.B-1, additional support has been provided from central college funds for equipment (as detailed under Criterion 7, section D) and travel.

Table 8.B-1. Program Academic Year Expenditures

Budget Category	AY06-07	AY07-08	AY08-09	AY09-10	AY10-11	Total
Commodities	3,860	13,870	11,184	12,412	19,722	61,047
Contractual Services	8,844	10,568	11,216	10,568	9,581	50,778
Equipment		16,740			5,968	22,708
Salaries & Benefits	459,941	472,069	559,613	580,138	602,594	2,674,355
Travel	17,645	31,228	17,646	6,898	8,474	81,891

AY10-11 figures are to-date through of 6/13/2011

The budget for the program, which consists of fixed and discretionary components, is supported only by the State of Alaska. Fixed components are the salaries for four faculty of mining engineering and (half) salary for the shared department administrative manager. The discretionary budget consists of teaching assistant, services and components, travel, and ad hoc needs. The discretionary amount allocated to the program depends on the CEM budget. UAF follows the “incremental” budget process; that is, the budget for a given year is based on the previous year’s budget. The Provost’s office adjusts CEM’s base budget up or down, depending on the fiscal situation. CEM may additionally receive (or be penalized) funding based on performance-based budget metrics. Ultimately, CEM adjusts the discretionary portion of the program budget up or down based on the budget it receives. Under the discretionary category, services and components are always funded at around $10,000. Discretionary funds go toward routine needs such as office supplies, lab consumables, and software licenses. The teaching assistant position is also always funded. Travel funding is not always provided, but when it is provided, funding is around $1,000 to $1,500 per faculty. The ad hoc portion of the discretionary budget is based on special opportunities and need. The program may receive ad hoc funds based on one-time UAF/CEM initiatives or salary savings from open positions and salary buyouts. Ad hoc funds can be quite large. Examples include $50,000 from the University of Alaska System (through Mining and Petroleum Training Service) in 2007–2009 for the Silver Fox mine;

$65,000 from CEM (including department faculty salary savings) in 2009 for the purchase of GPS equipment for MIN 202 lab; $5,000 from CEM for Silver Fox mine in 2010; $25,000 from CEM (including department faculty salary savings) for computer lab upgrades in 2010; and $65,000 for ventilation laboratory in 2011 (including $30,000 from CEM). See Appendix H for a list of all recent expenditures for continuous improvement of quality.

In addition to the funds just described, other funds such as privately established endowments may be used to enhance a component of the program, be it a laboratory upgrade or student development. Examples include:

- Stampede Endowment: The program consistently draws $10,000–$15,000 per year from the Stampede Endowment to fund student development activities, such as trips to the SME Annual Meeting.
- Rehab work for the Silver Fox mine funded in 2009 by the Mining and Geological Enrichment fund.
- Equipment/software purchases by research projects.

Barring sustained funds for professional development, the funding level is adequate to support the program.

C. Staffing

Due to the relatively small size of the engineering programs at the college, support personnel are shared across departments and programs. CEM has the following positions that are shared by all the engineering programs for a variety of direct and indirect instructional support:

- Two network technicians
- One technician and building safety officer
- One mechanical technician
- One academic advisor
- One recruiting coordinator
- One chief fiscal officer
- One academic manager

The Institute of Northern Engineering as part of CEM has several dedicated technicians and administrative personnel who provide services on an “as needed” basis.

D. Faculty Hiring and Retention

The process of hiring a new faculty starts with a memo from the department chair requesting permission from the Provost (through the Dean) to hire. Once the permission is received, a committee is formed by the program faculty in consultation with the department chair and Dean.

The committee develops the job description and follows university guidelines in the hiring process. Faculty searches, an integral part of the hiring process, are typically international.

As soon as the formalities are completed, the job is posted on UAKJobs, and formal ads are posted in professional society journals and circulated widely. After achieving a certain pool of applicants or after a specified date (determined by the search committee), the candidates go through multiple screening stages such as a review of the resume and qualifications, a telephone interview, and on-campus visits and reference checks. Near the end of the process, the committee makes a recommendation to the Dean in the form of a ranked list. Once the Dean's selection is made and approved by the Provost, an offer is made. Offered salaries typically conform to the Oklahoma State University salary survey.

Retention strategies for new faculty include targeted start-up funds to enable them to develop a successful research program early in their UAF career. Additionally, lower teaching loads are offered in the first two years, along with reduced service workload. All new faculty are assigned or may choose a faculty mentor, typically in their department, to help assist with the transition to a demanding academic career. Faculty development opportunities, through CEM and INE travel grants and through the UAF Office of Faculty Development, are intended to help with retention. If a current faculty member has a formal or informal job offer from another employer, the Dean has the option of increasing the salary for the faculty member in the form of a "retention raise."

E. Support of Faculty Professional Development

Sabbaticals are governed by the Collective Bargaining Agreement between UAF and the faculty union. Faculty consult with the department chair prior to applying for sabbatical leave. The consultation helps the department and the program plan for the absence. Faculty receive a semester's pay for a semester of sabbatical leave and six months pay for leave up to a year.

Professional development of faculty has been discussed in Criterion 6, Section D. As mentioned, faculty sponsor their professional development activities through a mix of college travel grants (competitively awarded), external research grants, non-university sponsors, and collegial generosity (one faculty member picking up costs of another). However, even when a faculty member receives a college travel grant, the grant is typically inadequate to fully cover all expenses. Occasionally, the college provides additional travel funding to the departments or, as has happened in recent years, faculty buyouts have allowed the department to fund travel internally. Though faculty have been able to undertake professional development activities until now, and have remained current, the long-term outlook is uncertain.

PROGRAM CRITERIA

Mining Engineering Curriculum

The Mining Engineering program at UAF has a balanced curriculum, which applies mathematics and sciences fundamentals to mining engineering-related problems. The program uses a group of faculty members with expertise in diverse areas such as mine ventilation, mining methods, operations research, rock mechanics, mine ground control, rock blasting, computational intelligence, geostatistics, computer-aided mine design, mineral processing, mine environmental engineering, mineral economics, and others. Our students have rigorous training in geological sciences, engineering sciences, and core subjects in mining engineering.

The following sections summarize the Mining Engineering program criteria as defined by the ABET guideline and the strength of the Mining Engineering curriculum at UAF.

- *The ability to apply mathematics including differential equations, calculus-based physics, and general chemistry, and probability and statistics as applied to mining engineering problems applications;*

  Mathematics and sciences courses in the Mining Engineering curriculum taken by all students to fulfill the degree requirements are as follows:

  CHEM 105X—General Chemistry (4 credits)
  CHEM 106X—General Chemistry (4 credits)
  MATH 200X—Calculus (4 credits)
  MATH 201X—Calculus (4 credits)
  MATH 202X—Calculus (4 credits)
  MATH 302—Differential Equations (3 credits)
  PHYS 211X—General Physics (4 credits)
  PHYS 212X—General Physics (4 credits)

- *Fundamental knowledge in the geological sciences including characterization of mineral deposits, physical geology, structural or engineering geology, and mineral and rock identification and properties;*

  Mining Engineering students are required to take a sequence of geologic sciences courses offered by the Geological Engineering program and the Department of Geology and Geophysics starting the freshman year:

  GE 261—General Geology for Engineers (3 credits)
  GEOS 262—Rocks and Minerals (3 credits)
  GEOS 332—Ore Deposits and Structure (3 credits)

- *Proficiency in statics, dynamics, strength of materials, fluid mechanics, thermodynamics, and electrical circuits;*

The fundamentals of engineering sciences and geomechanics are taught in basic ES courses:

ES 208—Mechanics (4 credits)
ES 307—Elements of Electrical Eng. (3 credits)
ES 331—Mechanics of Materials (3 credits)
ES 341—Fluid Mechanics (4 credits)
ES 346—Basic Thermodynamics (3 credits)

- *Proficiency in engineering topics related to both surface and underground mining, including: mining methods, planning and design, ground control and rock mechanics, health and safety, environmental issues, and ventilation;*

  The core courses of Mining Engineering curriculum are designed to cover these topics and to meet this criterion:

  MIN 103—Introduction to Mining Engineering (1 credit)
  MIN 104—Mining Safety and Operations Lab (1 credit)
  MIN 226—Mine Development (2 credits)
  MIN 302—Underground Mine Environmental Engineering (3 credits)
  MIN 370—Rock Mechanics (3 credits)
  MIN 407W—Mine Reclamation and Environmental Management (3 credits)
  MIN 409—Operations Research and Computer Applications in Mineral Industry (3 credits)
  MIN 454—Underground Mining Methods (3 credits)
  MIN 472—Ground Control (Elective, 3 credits)
  MIN 484—Surface Mining Methods II (2 credits)
  MIN 489W—Mining Design Project I (1 credits)
  MIN 490W—Mining Design Project II (2 credits)

- *Proficiency in additional engineering topics such as rock fragmentation, materials handling, mineral or coal processing, mine surveying, and valuation and resource/reserve estimation as appropriate to the program objectives.*

  These engineering topics are covered in the following courses:

  MIN 202—Mine Surveying (3 credits)
  MIN 225—Quantitative Methods (2 credits)
  MIN 301—Mine Plant Design (3 credits)
  MIN 313—Introduction to Mineral Preparation (3 credits)
  MIN 408O—Mineral Valuation and Economics (3 credits)
  MIN 415—Coal Preparation (Elective, 3 credits)
  MIN 443—Principles and Applications of Industrial Explosives (3 credits)
  MIN 482—Computer-Aided Mine Design – VULCAN (3 credits)

- *Laboratory experience leading to proficiency in geologic concepts, rock mechanics, mine ventilation, and other topics appropriate to the program objectives.*

  The following courses all contain a significant laboratory session that provides laboratory training and experience in the required topics:

  GE 261—General Geology for Engineers (3 credits)
  GEOS 262 – Rocks and Minerals (3 credits)
  MIN 104—Mining Safety and Operations Lab (1 credit)
  MIN 302—Underground Mine Environmental Engineering (3 credits)
  MIN 313—Introduction to Mineral Preparation (3 credits)
  MIN 370—Rock Mechanics (3 credits)

While it is clear that the program culminates in a capstone design experience, our students are also required to undertake many class and lab projects, which provide them with opportunities to design and solve mining engineering problems. Most of the upper-division (300 and 400 level) Mining Engineering courses just listed contain design components.

The capstone design experience for every graduating senior is the senior design project (MIN 489W and MIN 490W) where individual students or student teams define project tasks, conceptualize engineering activities under the scope of work, formulate technical approaches, and analyze data and provide solutions to engineering problems. Fundamentals of engineering economics and project management are an integral part of this course. Design projects always contain realistic engineering constraints.

Examples of recent projects are:

- Longhole Stoping of the “W” Deposit
- Wishbone Hill Surface Coal Mine Design
- The Downward Spiral: An Alaskan Gold Project
- Longwall Mine in Alaska

Faculty

All tenured and tenure-track faculty members share responsibilities for instruction of core subjects. One faculty member also teaches an engineering science course. As indicated in Criterion 6 – Faculty, all faculty members are maintaining currency in their specialty areas in a variety of ways that include the following:

- Continuing Professional Engineer registrations. The Alaska Board requires one to undertake 12 hours of professional development every year.
- Maintaining membership and participation in professional societies like Society for Mining, Metallurgy and Exploration, American Rock Mechanics Association, International Society of Explosives Engineers, Alaska Miners Association and others.
- Publishing in journals and conference proceedings.
- Attending and presenting papers at regional, national, and international conferences.
- Seeking and receiving research grants from foundations and institutes like National Science Foundation (through Alaska EPSCoR), Department of Energy, United States Air Force, and others.
- Conducting research in areas essential to Alaska economic development such as carbon sequestration, air inversion in arctic surface mines, and coal to liquids.
- Consulting to industry and governments.

See Appendix B – Faculty Vitae for specific information about what our faculty members are doing.

APPENDICES

Appendix A – Course Syllabi

Note that syllabi are organized in two different ways in this section. The first part contains syllabi on the courses that are in the outcomes matrix. In the second part are other courses (science/math) that are part of the program, but not in the outcomes matrix.

Department of Mining and Geological Engineering
University of Alaska Fairbanks

6. **Course information:**

Title: Introduction to Mining Engineering
Number: MIN F103
Credits: 1 Credit
Required Course
Prerequisites: N/A
Location: 406 Duckering
Meeting time: Monday 10:30 to 11:30 am (Fall semesters)

2. Instructor information:

Name: Sabry Sabour
Office location: 317 Duckering
Office hours: TBA
Telephone: 907-474-6917
email address: ssabour@alaska.edu

7. **Course readings/materials:**

Course textbook: Hartman, H. and Mutmansky, J. M., 2002. Introductory Mining Engineering, 2nd Edition, John Wiley & Sons, Inc.
Supplementary readings:
Hartman, H.L, Ed., 1992, Mining Engineers Handbook, SME, Littleton, Colorado (recommended)

8. **Course description:**

Concepts and methods utilized in mining engineering and mining unit operations.

9. **Course Goals:**

The course is designed to give the freshmen an introduction to concepts and practices of mining engineering. Both mining science and mine design are emphasized.

10. **Student Learning Outcomes:**

This course is contributing towards the following educational outcomes set forth by the Department of Mining and Geological Engineering

Outcome	Role of MIN 103
Outcome A: Knowledge of mathematics, science and engineering principles	Apply basic engineering formulas and concepts related to mining engineering.
Outcome H: Broad educational experiences and awareness and understanding of the impact of engineering on global and societal issues	Gain a basic understanding of the various mining issues, role minerals play in modern day society, global mining industry, sustainable development, air, water pollution issues, reclamation, mine closure legal and professional issues around the globe.

Outcome J: A knowledge of contemporary issues	Global climate change, air pollution, water quality standards, and changes in the land use, mine permits, and mine closures are all important contemporary issues. This course provides students with the basic understanding of mining processes, and various environmental problems attributed to mining, and remediation practices.

7. Instruction methods: Lectures

8. Course contents:

- The mining industry
- Stages of mining (prospecting; exploration; evaluation; development; exploitation)
- Unit operations in mining (drilling; blasting; loading and excavation; haulage and hoisting; auxiliary operations)
- Introduction to surface mining
- Introduction to underground mining
- Mining in the Arctic
- Regulations; health & safety; environmental & social issues
- Reclamation & Mine Closures

9. Course policies:

- UAF students are subject to the Student Code of Conduct (http://www.uaf.edu/schedule/conduct/#condu)
- Assignments, reports, presentations,…etc are to be submitted electronically by email
- Submissions should be in a professional format
- In accordance with the UAF code of conduct, plagiarism will not be tolerated
- Several quizzes will be given during the regular class time without prior announcements, absentees lose the quiz grade

10. Evaluation:

Grade (Total = 100%):

Seminars	20%
Assignments	10%
Surprising quizzes	10%
Med-term exam	20%
Final exam	40%

11. Support Services: None

12. Disabilities Services:

We will work with the Office of Disabilities Services (208 WHIT, 474-5655) to provide reasonable accommodation to students with disabilities.

MIN 104: Mining Safety and Operations Laboratory

Course Description (1 Credit, Required)

Practical training at the Silver Fox Mine in mining operations and safety. Course complies with Mine Safety and Health Administration (MSHA) 40 Hour new miner training.

Instructor: Gang Chen
Office: 315 Duckering Building
Phone: 474-6875
Office Hours: As Posted

Textbook: Class Handouts

Course Format

In addition to lectures, mine practice is held on Saturdays at the Silver Fox Mine, for 3 to 4 sessions. Students should come to class for mine practice in appropriate work clothes. You will likely get dirty and wet. Some rubber boots, mostly in sizes 10 to 12, are available. Bring your own boots if you have them, and wear heavy, warm socks in any case. Hard hats, ear plugs, safety glasses, and cap lamps will be provided. It is also suggested that you bring a lunch.

Grading

Course grades will be based on attendance, weekly quiz scores, and on the final. Attendance is mandatory! Grades will be calculated according to the following allocation:

Attendance and participation 50%
Weekly quiz scores 25%
Final Exam..... ....25%

Course Objectives

This course is designed to provide undergraduate students in mining engineering a practical orientation to the unit operations of underground mining. In close association, the hazards of underground mine operation, safe practices and engineered controls are stressed.

ABET Outcomes

Outcome	Role of Min 104
Outcome F: Understanding of professional and ethical responsibility	Mine safety is an individual, group, and supervisory responsibility. Each of these levels is addressed in the course, and the Mine Engineer's responsibility for worker safety, and hazard identification and control is stressed.

Scheduled Lecture Topics

1 Introduction to the Work Environment
2 Transportation and Communications
3 Entering and Leaving the Mine
4 General Health
5 Cleanup and Housekeeping
6 Hazard Recognition
7 Mine Gases
8 Explosives
9 Mine Maps, Emergency Evacuation Barricading
10 Ground Control and Ventilation Plans
11 Electrical Hazards
12 Safety of Assigned Tasks

MIN 202: Mine Surveying

Required Course

2008-09 Catalog Data:	Min 202 – Mine Surveying (2+3), 3 credits. Surveying principles for surface and underground control of mining properties. Field and office procedures for preparation of maps and engineering data. Prerequisites: Math 107X and 108 or equivalent.
Textbook:	J.M.Anderson and E.M. Mikhail, 1998, Surveying – Theory and Practice, 7th Ed., Mcgraw-Hill, NY
Instructor:	Sabry Sabour, Assistant Professor of Mining Engineering 317 Duckering Bldg, Ph: 474-6917, Email: ssabour@alaska.edu
Course Objective:	To provide undergraduate students in mining and geological engineering with the basic skills for measuring distance and angular relations in 3-dimendions, standard methods of recording survey data, determination of boundaries, areas and assessment of measurement errors. Compilation and reduction of data, and construction of maps, plans and cross sections for surface and underground features and structures are learned.

Skills to be acquired are:

1. An understanding of the application and accuracy of various surveying instruments in obtaining various types of data, i.e., horizontal and vertical angles; horizontal and vertical distances.
2. Collection and reduction of field measurements for use in the design and construction of various mining engineering projects.
3. Performance of surface and underground mine surveys, processing of data and preparation of mine maps
4. Working within a group

Topics:

1. Introduction to surveying & surveying instruments
2. The Transit, theodolite and their uses.
3. Angles (horizontal and vertical) measurements
4. Bearing; azimuth; and coordinates
5. Linear measurements; horizontal distance
6. Stadia and tacheometry
7. Traverse and traverse computations
8. Precise leveling and applications
9. Error, accuracy and precision
10. Area and volume calculations
11. Total station and applications
12. Global positioning Systems and applications

13. Underground Mine Surveying introduction
14. Use of auxiliary telescopes
15. Shaft plumbing
16. Horizontal curve layout
17. Vertical curve layout

Field and Laboratory Projects:

1. 3-point survey – measurement of horizontal angles with transits and theodolites.
2. Measurement of vertical angles with transit
3. Surface survey – close loop traverse with transit; processing of data
4. Extending a line past an obstacle (with transit offset)
5. Leveling and plotting of profiles; distance with stadia
6. Surface survey with total station – close loop traverse, processing of data, calculations and plotting of surface map
7. Global positioning system – survey, processing of data, and network adjustment
8. Underground survey –processing of data, calculations and plotting of map

Computer Use: Spreadsheet for data compilation and reduction
AutoCAD for plotting of maps

Grading:

Homework	20%
Field Check-offs	10%
Field projects	20%
Mid term & Final	50%

Estimated ABET Category content: Engineering Science, 3 credits or 100%

Course Outcomes: This course contributes to the following educational outcomes set forth by the Department of Mining and Geological Engineering.

Outcome	Role of Min 202 Mine Surveying
Outcome A. Knowledge of mathematics, science and engineering principles and the ability to apply the knowledge	Surveying requires direct application of trigonometry. Vertical curve layout (parabolic) applies differential calculus. Fundamental of optics, transmission and phase shift of light (traditional surveying) and satellite radio technology (GPS) are applied
Outcome F: Understanding of professional and ethical responsibility	The legal significance of standard survey y notes, and the legal responsibility of the professional surveyor (land surveyor) are stressed and understood.
Outcome K: Ability to use techniques, skills and modern engineering tools for engineering practice	Electronic distance measuring (EDM) device, total station, and global positioning systems (GPS) methods are used, in addition to traditional survey instruments. Personal computer-based calculations and graphics techniques (Spreadsheet, AutoCad) are standard modes of presentation of work.

Min 225: Quantitative Methods in Mining Engineering

Course Information: **2+ 0 Credit hours, Pre-Req**: **MIN 103; MATH 107X and MATH 108X; MATH 200X or Equivalent; or Permission of the Instructor,**

Fall, M & W, 8:00 AM – 9:00 AM

Required Course

2010 Catalog Description: Introduction to ore reserve estimation, classical estimation methods and techniques, error in estimations and pitfalls, introduction to classical statistics, introduction to geostatistics, ordinary Kriging, Block Kriging, modeling the sample variogram, coKriging, & global estimation. **Pre-Req**: **MIN 103; MATH 107X and MATH 108X; MATH 200X or Equivalent; or Permission of the Instructor,**

Course Instructors: Sukumar Bandopadhyay, PhD., P.E., Professor of Mining Engineering, 311 Duckering Building, College of Engineering & Mines, Ph: 904-474-6876, Email: sbandopadhyay@alaska.edu

Course Objectives: This course is designed to give the freshmen/sophomore students an introduction to concepts and practices in ore reserve estimation, using classical and geostatistical estimation techniques.

Text Books: (1) USBM IC 8283 (1966), (2) Practical Geostatistics 2000, By Isobel Clark & William V. Harper, Ecosse North America, LLC, Columbus , Ohio, USA, ISBN : 0-9703317-0-3.

Student Learning Outcomes: Fundamental knowledge Goals

1.1 An ability to apply knowledge of mathematics, science and engineering

1.2 An ability to analyze and interpret data

Student Learning Outcomes: Competency & Ability Goals

2.1 Be able to analyze data using simple statistical analysis

2.2 Be able to use classical estimation techniques to calculate ore reserve

2.3 Be able to use Geostatistical techniques such as simple kriging for ore reserve estimation.

Instructional Method: In class lectures, & case studies

Course Topics:

1. **Introduction to Statistics**

(a) Presenting & Summarizing exploration Data
(b) Samples & Population
(c) Frequency Distribution
(d) Characteristic of Distributions & Central Tendency
(e) Characteristics of Dispersion: Dispersion
(f) Sample size calculation
(g) Samples: Accuracy of the Mean

(h) Comparison of Means
(i) Comparison of Variances
(j) Hypothesis testing
(k) Data Analysis
(l) Non-parametric methods

2. Evaluating Mineral Deposits

(a) Criteria for method selection
(b) Analysis of exploration data
(c) Basic Assumptions
(d) Principles of Interpretation
(e) Rule of Nearest Points or Equal Influence
(f) Variability within Mineral Deposits
(g) Weighting in Reserve Calculations

3. **Classical Methods of Ore Reserve Computations**

(a) Average Factors & Area Methods
(b) Method of Analogy
(c) Method of Geologic Blocks
(d) Method of Isolines
(e) Cross Sectional Methods
f) Method of Triangles
(g) Method of Polygons
(h) Inverse Distance Square Methods
(i) Cutoff Grade & Tonnage Factors
(j) CASE STUDY # 1

4. Introduction to Geostatistics

(a) Spatial Description of Exploration data
(b) Contour Maps
(c) Spatial Continuity
(d) Correlation Functions, Covariance Functions & Variograms, Distribution of grades ,
(e) Relative variograms
(f) Point Estimation
(g) Ordinary Kriging
(h) Block Kriging
(i) Cokriging
(j) Case Studies II
(k) Case studies III

ABET category: 2 cr Engineering Science

MIN F226 – MINE OPERATIONS II

Spring Semester 2012

Required Course

2009-2010 Catalog Data: MIN F226 – Mine Development (2 + 0), 2 credits.

Pre-mining activities including surface water control and management. Haul road design, Underground mining methods selection criteria. Underground mining layout including access to ore body: Shaft, slope and ramp locations, shape, sizing & development. Development of access in frozen ground environment. Layout of development mains, cross-cuts, raises and winzes for ventilation, transport and optimum extraction of ore body. Level intervals, size and location of ore passes, design and optimization. Prerequisite: MIN 103 & Min 225

Textbook: Hartman, H., ed., 1992, SME Mining Engineers Handbook, 2 vols., SME

Coordinator: Sukumar Bandopadhyay, Professor of Mining Engineering
311 Duckering Building, College of Engineering & Mines.
Ph: (907)-474-6876, Email: sbandopadhyay@alaska.edu

Goals: This course is designed to provide undergraduate students in mining engineering with the elements of Mine development for coal and metaliferrous ore bodies for mineral production.

Student Learning Outcomes: Fundamental knowledge Goals

1.3 An ability to apply knowledge of mathematics, science and engineering

Student Learning Outcomes: Competency & Ability Goals

2.1 Be able to identify requirements for mine development in coal, and underground metal mines.
2.2 Be able to design shaft, slope and ramps, levels, ore passes based on economic consideration

Topics:

1. Review of Unit operations & Pre-Mining Activities

2. Surface Water Control and Management

   (1) Design and Construction Consideration of Selected Control structures
   a. Diversion Structures
   b. Diversion ditches
   c. Sediment traps
   d. Down Drain Structures
   e. Pipe Slope Drain
   f. Grassed Waterways

g. Outlet Protection
h. Riprap
i. Sediment Basin
j. Sediment Removal Design procedure & Design Example
k. Runoff calculations
l. Culvert Installation & Emergency spillway Design Criteria

3. Haul Road Design

4. Surface Vs. Underground Mine
   (a) Strip ratio and economic strip ratios
   (b) Ultimate pit

5. Underground Mining Methods Selection Criteria

6. Access to ore body
   (a) Shaft Vs. Slope, location, methods of development
   (b) Shaft Sinking, Deeping of existing shafts, full face boring
   (c) Shaft sizing, shaft lining, rock mechanics consideration
   (d) Slope development, location, shape, sizing, and full face boring
   (e) Ramp, shape, sizing , location, and development
   (f) Access Development in frozen ground

7. Stope development to support production activities

8. Development of mains in coal mines, location, size and shape, doors and air crossings, Geo-mechanics consideration

9. Development of main levels, optimum level differences in metal mines. Cross cuts, raises and winzes, methods of driving raises, winzes & ore passes, Raise boring, economic criteria, Ore and waste passes and ore chutes, locations, sizing, and maintenance.

10. Underground Coal storage bunkers & Underground crusher stations, large excavations, rock mechanics & related issues.

11. Development of underground sump, sizing, and excavation practices

MIN F 301- Mine Plant Design

Spring (Required Course)

2009-10 Catalog Data: MIN F 301: Mine Plant Design. 3 credits. Quantitative study and design of various systems and equipment used in haulage, hoisting, drainage, pumping, and power (Compressed air & Electricity). Importance of natural conditions and production level in the equipment selection procedure emphasized. **Prerequisites: ES F208 and ES F307. Recommended ES F341**

Textbook: Mining Engineering Analysis, 2nd Edition, By Christopher J. Bise, SME Publications

References: Mining Engineering Handbook, 2nd Edition, SME
Surface Mining, 2nd Edition, SME

Coordinator: **Sukumar Bandopadhyay, Professor of Mining Engineering**
311 Duckering Building, Ph: 907-474-6876, Email: sbandopadhyay@alaska.edu

Course Objectives: This course is designed to present a modern and comprehensive treatment to various components of the operating support system, such as drainage, power, material transport and those operations that keep the mine running efficiently. The students should be able to understand the interrelationship between the production system, the operating support system, the ventilation system, and material transport system, and would be able to select appropriate equipment for haulage, hoist, drainage, and power systems.

Topics:

1. Principle of Mine Planning (1 class)
2. Mine Hoisting Systems (5 class)
3. Pumping and Mine Dewatering (5 class)
4. Compressed Air(5 classes)
5. Electric Power (4 classes)
6. Rail, Belt & Truck Haulage Systems (21)
   - Rail Haulage
   - Belt Conveyor & Conveyor Belt Selection
   - Truck Haulage Systems
   - Face Haulage Systems
7. Mine Plant Design Challenges in Arctic mines; planning & design (2 classes)
8. Tests (2 classes)

Course Outcomes: This course is contributing towards the following educational outcomes set forth by the Department of Mining and Geological Engineering.

	Outcome	Role of Min 301
C	An ability to design an engineering system, component or process to meet desired needs	The students will be able to estimate key parameter values for design of haulage, drainage, hoist, and mine power systems
E	An ability to identify , formulate, and solve engineering problems	The students will be able to interpret, analyze and design materials transport system.
L	A knowledge of unique engineering & environmental issues in the arctic and subarctic regions	The students will have knowledge of the arctic mine transportation challenges and would be able to identify unique environmental constraints in the arctic.

ABET Category: Engineering Design (3 Cr)
Computer Application: None

MIN 302- Underground Mine Environmental Engineering

Spring (Required Course)

2009-10 Catalog Data: MIN 302: Underground Environmental Engineering. 3 credits (2+3). Analysis of underground mine ventilation systems, ventilation requirements and system structure, ventilation planning, design, and engineering control, mine ventilation network, gas and dust explosion, rescue and recovery.

Textbook: Mine Ventilation and Air Conditioning, by H. L. Hartman, 3rd Edition, Wiley-Interscience.

References: 1969 Mine Health and Safety Acts, Amended 1977
Handouts from other texts and USBM Information Circulars.

Coordinator: **Sukumar Bandopadhyay, Professor of Mining Engineering**
311 Duckering Building, Ph: 907-474-6876, Email: sbandopadhyay@alaska.edu

Course Objectives: This course is designed to present a modern and comprehensive treatment to planning and designing underground environmental systems and its control. This course will develop the students' ability to analyze underground environmental engineering practice from the view point of total mine atmospheric environment, design, and control systems.

Prerequisites: Min 103- Introduction to Mining Engineering, ES 341- Fluid Mechanics

Topics:

- Mine gases and dust (2 classes)
- Temperature, heat and humidity control (1 class)
- Fundamentals of air flow in mines (1 class)
- Basic mine ventilation circuits (3 classes)
- Mine ventilation survey (2 classes)
- Natural mine ventilation (1 class)
- Mechanical ventilation of mines by fans (2 classes)
- Ventilation of mines by fans (2 classes)
- Design of face ventilation system (2 classes)
- Ventilation systems design (7 classes)
  - Design of Coal Mine Ventilation system
  - Design of metal mine ventilation system
  - Design of tunnel ventilation

10. Mine ventilation network theory (2 classes)
11. Arctic mine ventilation planning & design (3 classes)
12. Tests (2 classes)

Laboratory Projects:

2. Gas and dust concentration measurements in mines.
3. Bernoulli Theorem demonstration.
4. Quantity measurements in the lab fan duct using Pitot tube.
5. Ventilation instrumentation – measurements
6. Pressure Survey – pressure gradient, friction factor, and equivalent length.

7. Altimeter survey
8. Development of mine characteristics curves
9. Development of fan characteristic curves (series & parallel fan operations)
10. Ventilation network simulations

Course Outcomes: This course is contributing towards the following educational outcomes set forth by the Department of Mining and Geological Engineering

	Outcome	Role of Min 302
B	An ability to design and conduct experiments, as well as to analyze and interpret data;	Students conduct many experiments and interpret the data
C	An ability to design an engineering system, component or process to meet desired needs	The students will be able to estimate key parameter values for design of a mine ventilation system.
L	A knowledge of engineering for arctic and subarctic conditions	The students will learn the challenge permafrost presents in the design of mine ventilation systems in the arctic and subarctic.

ABET Category: Engineering Design: 2.0 Cr

Computer Application: None

MIN 313- Introduction to Mineral Preparation, 3 Credits, Required, Alternate Fall Semesters

Prerequisite: Junior standing or permission of instructor

Catalog Data: MIN 313: Introduction to Mineral Preparation. 3 credits (2+3). Elementary theory and principles of unit processes of liberation, concentration and solid-fluid separation as applied to mineral beneficiations.

Textbook: Mineral Processing Technology; by B.A. Wills, 5th Edition.

References: SME Mineral Processing Handbook, N.L. Weiss, editor, 1985
Belt Conveyors for Bulk Materials (CEMA, SME), 2nd edition., 1997
Introdution to Mineral Processing, Kelly and Spottiswood, 1982
EPRI Coal Cleaning Cost Model, 1993
Western Mine Engineering Costing Service, 2005

Coordinators: Daniel E. Walsh, Professor of Mineral Preparation Engineering
Hsing K. Lin, Professor of Mineral Preparation Engineering

Course Objectives: This course is designed to present a modern and comprehensive treatment of the engineering theory and design considerations for processing geologic materials after they have been extracted from the earth. This course will develop the students' ability to comprehend the various unit processes employed in contemporary processing facilities integral to metals and coal mines.

Contribution to Professional Component: Mining Engineering and Design, 3 Credits - This course provides students with a fundamental knowledge of industrial unit processes used in mineral processing and the theory behind their application. It prepares students for applying mineral processing knowledge to end products costs and marketability, and the treatment of waste materials.

Topics:

1. Metallurgical accounting and mass balances
2. Ore handling, sampling and analyses
3. Sampling theory and samplers
4. Size analysis
5. Liberation, crushing and grinding
6. Classification
7. Screening
8. Gravity Concentration
9. Magnetic Separation
10. Floth Flotation
11. Dewatering
12. Flowsheet Practice
13. Field trip to Fort Knox Mine

Laboratory Projects:

1. Slurry flow measurements and calculations
2. Sampling, sample preparation and Assaying
3. Sieve analysis
4. Crushing, sieve analysis and liberation

5. Bond grindability test proceedure
6. Gravity concentration (jigs, tables, spirals, tables, bowls and elutriators)
7. Froth Flotation
8. Magnetic and electrostatic separation
9. Flocculation and sedimentation
10. Computer simulation

Course Outcomes: This course is contributing towards the following educational outcomes set forth by the Department of Mining and Geological engineering. The following table offers details by outcome.

Outcome	Role of Min 415
Outcome A: An ability to apply knowledge of mathematics, science & engineering	Use of fundamental engineering principles and implementation of the knowledge gained in mathematics courses, through homework and laboratory assignments.
Outcome E: The ability to identify, formulate and solve engineering problems	Students learn to evaluate, quantify and solve mineral processing problems involving, mineral liberation, the separation of valuable minerals from gangue, solid-liquid separation, tailings treatment …
Outcome K: An ability to use the techniques, skills and modern engineering tools necessary for engineering practice	Students learn to understand the behavior of geologic materials within the mineral processing plant environment, then apply their understanding for unit process selection and design, using contemporary engineering tools & practice.

Prepared by: Daniel E. Walsh, with the assistance of faculty from the Mining and Geological Engineering Department, School of Mineral Engineering, UAF.

MIN 370: Rock Mechanics

Required

Course Description (3 credits, Required)

Physical and mechanical properties of rock; rock mass classification systems; stress distribution in the vicinity of mining openings, design criteria and support for structures in rock mass, instrumentation and monitoring of opening's stability as well as strata control and surface subsidence.

Instructor: Gang Chen
Office: 315 Duckering Building
Phone: 474-6875
Email: gchen@alaska.edu
Office Hours: As Posted

Textbook: Rock Mechanics for Underground Mining, 3rd Edition, by B. H. G. Brady and E. T. Brown

References: Class Handouts from various sources

Prerequisites: ES331 (Mechanics of Materials) or permission of instructor

Grading

Homework 25%
Midterm Exam 25%
Final Exam..... ....25%
Lab Reports..... ....25%

Policies

Homework assignments will be given throughout the semester. The due date for each assignment will be specified when the assignment is given. Any assignment or lab report submitted after the due date, if accepted, will be subject to a 50% late penalty.

Course Objectives:

1. Through the course of the study, the students should have a good understanding of the fundamental theories of rock mechanics as applicable to mining engineering. The students should become familiar with the commonly used models and principles in rock mechanics and have a good mastering of the basic concepts in rock mechanics analysis and rock excavation design.
2. Through the laboratory testing practice, the students should gain the skill on standard rock mechanics testing operations. The students should become familiar with typical rock mechanics testing equipment and have good knowledge of a number of standard testing procedures. They should also be able to prepare quality rock testing results reports for engineering applications.
3. Through the classroom study and laboratory practice, the students should become familiar with rock mechanics instrumentation and monitoring techniques. They should be able to apply a number of different testing and monitoring tools, perform data collection, and conduct data reduction and analysis for engineering applications.
4. Through field trips to operating mines, the students should gain the first-hand knowledge of applying the rock mechanics principles to actual mine designs and mining operations. The students' interaction with mining professionals during the field trips should give the students good understanding of the complexities of rock mechanics problems in the real world.

Course Outcomes: This course is considered to contribute towards the following educational outcomes set forth by the Mining and Geological Engineering Department

Outcome	Role of MIN370
Outcome A: An ability to apply knowledge of mathematics, science & engineering Principles	Use of fundamental mechanics of materials principles and application of mathematical knowledge gained in calculus and other math courses.
Outcome B: An ability to design and conduct experiments and the ability to analyze the data, interpret results and draw conclusions	A series of laboratory experiments are formulated in the course for the students to design, prepare and conduct the rock testing experiments in the laboratory. The students will learn to perform the tests and collect data with computerized control and data acquisition system. They will be trained in the class to carry our data reduction, generate graphs, analyze data and draw conclusions from the results.
Outcome K: The ability to use the techniques, skills and modern engineering tools for engineering practices	The class will train students to utilize laboratory equipment and computer tools for the required engineering work.

Laboratory Experiments:

1. Rock Quality Designation (RQD) Measurement
2. Schmidt Hammer Testing
3. Point Load Index Testing
4. Uniaxial Compressive Strength Testing
5. Deformability of Rock in Uniaxial Compression
6. Triaxial Compressive Strength Testing
7. Brazil Test for Indirect Tensile Strength of Rock
8. Sonic Velocity Test of Rock
9. Direct Shear Strength Testing

Schedule

Week	Topic
1	Introduction
2	Rock Mass Classification Systems
3	Rock Strength and Failure Criteria
4	Rock Strength and Failure Criteria
5	Initial Stress in Rocks and Measurements
6	Spring Break
7	Planes of Weakness in Rocks
8	Planes of Weakness in Rocks
9	Deformability of Rocks
10	Deformability of Rocks
11	Design and Support of Underground Openings
12	Rock Slope Engineering
13	Rock Slope Engineering
14	Subsidence Prediction and Control
15	**Final Exam (3:15am - 5:15pm)**

Department of Mining/Geological Engineering
College of Engineering and Mines

University of Alaska Fairbanks

MIN F407 Mine Reclamation and Environmental Management (3.0 Credit), Required
Fall 2010 09/23/2010
Course Description: The course covers principles and practices of mine reclamation and waste disposal. Emphases were put on environmental responsibilities, permitting, reclamation and revegetation of mined land, environmental management, acid mine drainage, effluent treatments, and case study of Alaska mines.
Prerequisite: CHEM 106X, ENGL 111X, ENGL 211X, or 213X, (or permission of instructor)

Class Meets: T, R, 09:45A-11:15A, Duck 316

Instructor: H. K. (Steve) Lin
Office: Duckering 405
Email hklin@alaska.edu
Phone: 474-6347

Text: none.

References: Mining Environmental Handbooks, 1997, by J. J. Marcus (Editor), Imperial College Press, Imperial College, London.

Tailings Management, 1989, by G. M. Ritcey, Elsevier Science Publishing Co. Inc., New York, New York.

Office Hours: T,R, 3:00-4:00 PM,
Other times by appointment

Topics Covered: See next page

Grading Policy:

Exam	30%	A	90-100%
Homework	20%	B	80-89%
Midterm Report	20%	C	70-79%
Final Report & Presentation	30%	D	60-69%
		F	below 60

Make-up Policy: No make-ups unless:
1) medical or family emergencies or
2) pre-approved UAF affiliated activities.

Documental proof is needed for both cases.

Topics
Introduction
Environmental Regulatory Controls and Environmental Responsibilities
Permits and Environmental Protection
Reclamation and Revegetation of Mined Land
Reclamation of nonferrous and Coal Mines
Mining System Design for Site Specific Environmental Protection
Environmental Management of Mining Operations
Acid Mine Drainage
Effluent Treatment for Environment Control
Case Study
Report Presentation

Topics subject to change

Course Outcomes: This course is contributing towards the following educational outcomes set forth by the Department of Mining and Geological engineering. The following table offers details by outcome.

Outcome	Role of Min 407
Outcome G: An ability to communicate effectively.	Students learn to both write technical reports and present them effectively.
Outcome H: The broad education necessary to understand the impacts of engineering solutions in a global, economical, environmental, and social context.	The course covers general impacts of mining operations on living, environmental and economical aspects with the emphasis on waste management.
Outcome J: A knowledge of contemporary issues.	Some contemporary issues related to mine reclamation and waste management include environmental concerns such as acid mine drainage will be introduced.

MIN F408 O- Mineral Valuation and Economics

Required Course / Spring Semester

2010 Catalog Data: MIN F408 O: Mineral Valuation and Economics. 3 credits (3+0). Introduction to engineering economics, ore sampling and reserve calculations, and mine feasibility studies. (Prerequisites: COMM F131X or COMM F141X; GE F375 or MIN F301)

Textbook: Economic Evaluation and Investment Decision Methods
by Stermole, F.J. and Stermole, J.M., 12th Edition
ISBN 978-1-878740-18-2
Lectures may be supplemented by handouts.

References: Western Mine Engineering Costing Service

Coordinators: Daniel E. Walsh, Professor of Mineral Preparation Engineering
Rajive Ganguli, Professor of Mining Engineering

Course Objectives: This course is designed to present a modern and comprehensive treatment of the engineering economic analysis, and will develop the students' ability to analyze engineering investment opportunities using DCFROR techniques. Students are also introduced to sources of capital and operating costs estimates for developing cash flow timelines for investment analysis, as well as ore sampling and reserve calculations.

Contribution to Professional Component:

This course provides students with a fundamental knowledge of DCFROR analysis, investment opportunities decision criteria and the theory behind their application. It prepares students for applying this knowledge to real-world engineering problems; focusing on mining and geological engineering.

Prerequisites: COMM F131X or COMM F141X; GE F375 or MIN F301

Topics:

7. Mineral Valuation
8. Compound Interest Formulas and Applications
9. Present, Annual & Future Value; ROR and Break Even Analysis
10. Cumulative Cash Position Diagrams and Ratio Analysis
11. Mutually Exclusive and Non-Mutually Exclusive Project Analysis
12. Capital & Operating Costs and Cash Flows
13. Depreciation, Depletion and Amortization
14. Income Taxes and After-Tax Investment Decisions
15. Escalated & Constant Dollars

16. Risk and Uncertainty Analysis
17. Student Presentations (x 2)

Course Outcomes: This course is contributing towards the following educational outcomes set forth by the Department of Mining and Geological Engineering. The following table offers details by outcome.

Outcome	Role of Min 313
Outcome E: The ability to identify, formulate and solve engineering problems	Students learn to evaluate, quantify and solve engineering economics problems involving, NPV, NAV, NFV, ROR, GROR, PVR and BCR ratios, payback periods and breakeven analysis after developing appropriate investment time lines.
Outcome G: The ability to communicate effectively	Students prepare and deliver two oral presentations during the semester, with emphasis on public speaking best practices as provided by the UAF Speaking Center (Guest lecture provided).
Outcome K: An ability to use the techniques, skills and modern engineering tools necessary for engineering practice	Students learn to analyze investment opportunities, such as mutually exclusive options, non-mutually exclusive options, service producing options, and a single investment compared to investing elsewhere at MROR, using both before tax and after tax analysis cash flows, as well as other important economic/financial considerations.

Prepared by: Daniel E. Walsh, with the assistance of faculty from the Mining and Geological Engineering Department, College of Engineering and Mines, UAF.

Originally Prepared: March 17, 2011

MIN 409- Operations Research and Computer Applications in the Mineral Industry

Spring (Required Course)

2008-09 Catalog Data: MIN 409: Operations Research and Computer Applications in the Mineral Industry. Credits (3+0). Introduction of the concept of a mine as a system, structuring real life problems into mathematical model, and use of operations research and computer techniques for understanding, analysis, forecasting and optimization of mining operations and systems.

Textbook: Course notes.

References: Handouts from other journals, publications, and APCOM proceedings.

Coordinator: Sukumar Bandopadhyay, Professor of Mining Engineering.
311 Duckering Building, College of Engineering & Mines
Ph: 904-474-6876, Email: ffs0b@uaf.edu

Office Hours: **Monday, Wednesday & Friday: 10:00 AM – 11:00 AM**

Course objectives: This course is designed with particular emphasis on the following objectives:(i) to maximize the efficiency of a given mining system or equipment; (ii) decide the optimize choice of methods or equipment for a given set of conditions; (iii) aid in long range and short range mine planning and design; (iv) use of operations research and computer model to study the complex problems and activities of mine system as a single process; analyze the relationship of one part to the overall mine system.

Prerequisites: **Junior standing in mining engineering**

Topics:

1. Introduction to the optimization problems in the mineral industry
2. Application of Statistics to mining decision problems
   - Presenting & Summarizing Data
   - Samples & Population
   - Frequency Distribution
   - Characteristic of Distributions & Central Tendency
   - Characteristics of Dispersion: Dispersion
   - Sample size calculation
   - Samples: Accuracy of the Mean
   - Comparison of Means
   - Comparison of Variances
   - Hypothesis testing
   - Data Analysis
   - Non-parametric methods
3. Time analysis & development of cycle time models
4. Linear Programming models in the mineral industry
   (i). Problem formulation and graphical solution
   (ii) Simplex Algorithm
   (iii) Transportation problems.
   (iv). Assignment problems
   (v). Duality and post optimal analysis of LP solutions

5. Network Analysis
   (i) Project planning and control with CPM and PERT
   (ii) Critical Path analysis – applications in the mineral industry
   (iii) Optimum allocation of resources among the activities of a network.
   (iv) Crushing of project networks
   (v) Simulation of PERT network
6. Mine Systems Simulations
   (i) Basic concepts and limitations
   (ii) Statistical distributions
   (iii) Random number generation
   (iv) Random variate generation
   (v) Monte Carlo simulation
   (vi) Simulation of a simple truck haulage system
   (vii) Simulation of mining systems
   (viii) Validation & Analysis of simulation runs
   (ix) Risk simulation
7. Inventory Control Models
   (i) Infinite delivery rate with no backordering
   (ii) Finite delivery rate with no backordering
   (iii) Infinite delivery rate with backordering
   (iv) Finite delivery rate with backordering
8. Decision Theory & Its application to mining

Course Outcomes: This course is contributing towards the following educational outcomes set forth by the Department of Mining and Geological Engineering

	Outcome	Role of Min 409
B	An ability to design and conduct experiments, as well as to analyze and interpret data;	The students will be able to analyze data using simple statistical methods.
K	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	The students will be able to develop CPM and PERT networks for mining problems and conduct a critical path analysis of a construction project. The students will have understanding of simulation as a tool for mine system analysis.

MIN 443

Principles and Applications of Industrial Explosives

Course Description (3 Credits, Required):

Types and properties of industrial explosives; systems of initiation; theories of blasting; designs of open pit bench blasting; designs of underground blasting rounds applications in mining, civil construction, and other fields; blasting vibration, structural damages and their control; overbreak control; safe practices; safety regulations; blast hole drilling and drilling equipment. (Prerequisites: MIN 370 or Permission of instructor.)

Optional Textbook: Persson, Per-Anders, et al., Rock Blasting and Explosives Engineering

References:

Hustrulid, William A., "Blasting Principles for Open Pit Mining", v.1. General Design Concepts, v.2. Theoretical Foundations, Balkema, 1999, 1013p.

ISEE, "Blasters' Handbook", 17th Edition, ISEE, 1998, 742p.

Hartman, H. L., senior editor, "SME Mining Engineering Handbook," Society for Mining, Metallurgy, and Exploration, 2nd edition, Vol. 1, 1992, pp680-760.

Atlas Powder Company, "Explosives and Rock Blasting,", 1987.

Class Handouts from various sources

Instructor: Gang Chen
Office: 315 Duckering
Phone: 474-6875
Office Hours: As posted

Course Objectives:

5. Through the course of the study, the students should have a good understanding of the basic knowledge of commercial explosives that are commonly applied in rock blasting operations. The students should master the fundamental theories on rock blasting for blasting designs in mining operations and civil constructions. The students should also have a clear understanding of the environmental impact of the rock blasting as well as the safety issues related to explosives and blasting.

6. Through the course of the study, the students should be able to apply the knowledge of explosives and the fundamental theories on rock blasting to collect necessary data and information related to rock blasting and conduct blasting designs for mining operations and civil constructions based on the information collected.

7. Through the course of the study, the students should be able to apply the knowledge and the theories gained in the class to adjust existing blasting designs, optimize the blasting results and minimize adverse environmental impact of the blasting.

8. Through field trips to operating mines, the students should gain the first-hand knowledge of applying the rock blasting principles to actual mining operations. The students' interaction with mining professionals during the field trips should give the students good understanding of the complexities of the real world problems.

Course Outcomes: This course is considered to contribute towards the following educational outcomes set forth by the Mining Engineering Program

Outcome	Role of MIN443
Outcome E: An ability to identify, formulate, and solve engineering problems	The students will be trained in the class to collect data on blasting pattern designs, analyze the data, identify problems in the designs, apply the knowledge and theories gain in the class to find solutions for the problem and/or optimize the blasting designs. These trainings will be carried out through homework and class projects.
Outcome K: The ability to use the techniques, skills and modern engineering tools for engineering practices	The students will be trained in the class to use seismograph and computer tools for rock blast monitoring and design.

Grading:

Midterm Exam 25%
Final Exam..... ....25%
Homework Assignments..... .....25%
Term Paper and Presentation 25%

Topics:

1 Introduction
2 Mechanics of Rock Penetration
3 Drilling and Boring Machines
4 History and Development of Explosives
5 Classification and Characteristics of Explosives
6 Mechanisms of Fragmentation by Blasting
7 Initiation Systems
8 Surface Blasting Design
9 Underground Blasting Design
10 Controlled Blasting Techniques
11 Blasting Vibration and Air Blast
12 Blasting Safety and Regulation

MIN 454: Underground Mining Methods, Required Course

1. 3 credits, MWF 9:15A-10:15 A
2. Instructor: Rajive Ganguli, PhD, PE
3. Text: *Underground Mining Methods: Engineering Fundamentals and International Case Studies*, Eds. Hustrulid and Bullock, SME Publication
    a. other supplemental materials: *Mining Engineering Handbook Handbook*, SME Publication, Handouts
4. Course Description
    a. Underground mining methods for coal and non-coal deposits. Includes design parameters, selection of mining methods, the mine planning process, auxiliary operations, and various underground mining methods.
    b. Prerequisites: MIN 301, 302, 370
    c. Required for the BS(Mining Engineering) program
5. Specific goals for the course
    a. To be introduced to the various coal and non-coal underground mining methods and basic strata mechanics computations. The students will be able to evaluate mining conditions and decide on the appropriate mining method to be followed, following which, they will be able to initiate broad design of the mine, including equipment needs.
    b. Course Outcomes

Outcome	Role of MIN 454
Outcome E: The ability to identify, formulate and solve mining and geological engineering problems	Designing a mining method requires the ability to identify and formulate mining engineering features and problems. The design is expected to solve the anticipated problems. The student's ability to identify and formulate and solve the various issues are tested in homework and tests alike.
Outcome L: A knowledge of unique engineering and environmental issues in the arctic and subarctic regions.	Some aspects of mining are impacted by cold climates. These are discussed as relevant in the class. Student grasp of this knowledge is tested in homework or tests.

Estimated ABET Category Content: Engineering 3 Credit

7. Course Content (approx duration in weeks give in parenthesis)
    1. *Basics*: Rock mass ratings (1) and their applicability.
    2. *Coal Mining* (4) - Topic includes (yield) pillar design using ALPS and ARMPS.
        - Basics of coal mine design, and room and pillar mining, longwall mining.
    3. *Non-coal Mining (5)* - includes caving theories
        - self supported methods - Room and pillar, Sub-level stoping, Shrinkage stoping, Vertical Crater Retreat
        - artificially supported methods - Cut and fill
        - caving methods - Sub-level caving, Block caving, Longwall mining
    4. *Arctic Mining* (1) – Engineering challenges and examples
    5. *Operational Practices* such as bolting, shot creting, basic blast design (1)

MIN 482: Computer Aided Mine Design – VULCAN, Required Course

1. 3 Credits, MF 3:30PM - 5:00 PM
2. Instructor: Rajive Ganguli, PhD, PE
3. Text book: None exists for this topic. Handouts & Vulcan help files. Maptek Customer Service
4. Course information
   d. Description: Familiarization with VULCAN Mine design software to store, manage, model and display exploration data. Estimate volume, tonnage and quality of reserve, design declines and development drives in underground mines, design mine plans and design of underground stopes, perform underground grade control
   e. prerequisites or co-requisites: Junior or senior standing in Mining Engineering, Geological Engineering, or permission of instructor
   f. Required course for the BS(Mining Engineering) program
6. Specific goals for the course: This course is designed to familiarize students with a comprehensive mine design software.
   a. After taking the course, the student will be able to:
      i. Create and manipulate strings, layers and 3D objects
      ii. Develop a drillhole database from spreadsheet files
      iii. Display drillhole data, create geologic sections, model an orebody
      iv. Develop block models, develop and apply scripts, develop and apply ore reserve estimation algorithms
      v. Design stopes, ramps, shafts.
   b. ABET Outcomes

Outcome	Role of MIN 482
Outcome 3 or C. Ability to design system, component or process to meet needs	The students will create databases, develop geologic models, apply block modeling and create mine structures. Thus, they design components of a 3D mine model, while designing the entire mine (system).
Outcome K: The ability to use appropriate modern techniques, skills and tools, including computer applications necessary for engineering practice.	This is a mine design course that requires use of state-of-the-art computer aided design tools.

Estimated ABET Category Content: Engineering 3 Credit

7. Course content (approximate duration in weeks given in parenthesis)

- Introduction to 3D Design (2)
- Introduction to data structure, building a data base, 3-D visualization of database (3)
- Orebody Modeling (2)
- Block Modeling (3)
- Mine Design (4)
  - Design Stopes
  - Create ramps, shafts.
  - Primitives
  - Advanced Reserve Editor
  - Ventilation simulation
- Other (if time permits): Plotting etc

1. Course information:

Title: Surface Mining Methods
Number: MIN F484
Credits: 2 Credits
Prerequisites: senior standing, concurrent enrollment in MIN F409, or permission of instructor
Location: 306 Duckering
Meeting time: Tuesday and Thursday 11:30 am to 12:30 pm (spring semesters)
Required Course

2. Instructor information:

Name: Sabry Sabour
Office location: 317 Duckering
Office hours: Tuesday and Thursday 1:00 pm to 2:00 pm
Telephone: 907-474-6917
email address: ssabour@alaska.edu

3. Course readings/materials:

Course textbook: Hustrulid, W. and Kuchta, M., 2006. Open Pit Mine Planning & Design, 2nd Edition, Taylor & Francis plc., London, UK
Supplementary readings:

- Kennedy, B.A., 1990, Surface Mining, 2nd Edition, SME, Littleton, Colorado (recommended)
- Hartman, H.L, Ed., 1992, Mining Engineers Handbook, SME, Littleton, Colorado (recommended)
- Rendu, J.M., 2008. Introduction to Cut-off Grade Estimation, SME, Littleton, Colorado (recommended)

4. Course description:

Modern methods of surface mine design. Strip and open pit optimization techniques. Production planning and scheduling. Use of mine design software.

5. Course Goals:

This course is designed to give senior and/or graduate-level students in mining engineering and geological engineering a working familiarity with the principles of surface mine planning and design including: open pit economics, cutoff grade, breakeven stripping ratio, pit definition and optimization by graphical and algorithmic processes, road and pit slope design, production operations and scheduling for open pit mines

6. Student Learning Outcomes:

- Outcome E: An ability to identify, formulate, and solve engineering problems
- Outcome L: A knowledge of unique engineering and environmental issues in the arctic and subarctic regions.

7. Instructional methods: Lectures

8. Course calendar:

1. Introduction & overview (1 hr)
2. Open pit project economics (1 hr)
3. Block models and block value calculations (3 hrs)
4. Cutoff grade (2 hrs)
5. Pit slope analysis (3 hrs)
6. Stripping ratio (1 hrs)
7. Pit limits (6 hrs)
8. Production planning (3 hrs)
9. Design & layout of roads (2)
10. Surface mining methods (3 hrs)
11. Equipment selection (2 hrs)
12. Mine design software (3)

9. Course policies:

- UAF students are subject to the Student Code of Conduct (http://www.uaf.edu/schedule/conduct/#condu)
- Assignments, reports, projects,…etc are to be submitted electronically by email
- Penalty for late submissions is -20%/day, no submission is acceptable after 4 days
- Submissions are due at 5:00 pm of the due date. Submissions after 5:00pm are one-day late until 5:00pm of the next day, then they are two-day late,….
- Submissions should be in a professional format
- In accordance with the UAF code of conduct, plagiarism will not be tolerated
- Several quizzes will be given during the regular class time without prior announcements, absentees lose the quiz grade.

10. Evaluation:

Grades will be based on absolute scores

Evaluation Compenents

Assignments	30%
Unannounced quizzes	10%
Seminars	10%
Mid-term exam	20%
Final exam	30%
Total	100%

Letter Grades

A	>=90%
B	80% to <90%
C	70% to <80%
D	60% to <70%
F	<60%

11. Support Services: None

12. Disabilities Services:

We will work with the Office of Disabilities Services (208 WHIT, 474-5655) to provide reasonable accommodation to students with disabilities.

MIN 489 – Mine Design Project – I, Required Course

1. 1 credit, F 2-3pm
2. Rajive Ganguli, PhD, PE
3. Text book: None
    a. other supplemental materials
       Mining Engineering Handbook
       Mining Engineering, Journal
       Underground Mining Methods
       SME Code of Ethics
       AK Professional Engineering Statutes: Ethics
4. Specific course information
    a. Course Description: This course is a pre-cursor to MIN 490W. The student is expected to meet with the instructor to finalize the senior design project topic, lay out a project plan, gather data and prepare (such as formatting electronic data) as necessary for the successful execution of the project in MIN 490W.
    b. prerequisites or co-requisites: ENGL 111X; ENGL 211X or ENGL 213X or permission of instructor; MIN 301, MIN 302 and MIN 370.
    c. Required course for the BS(Mining Engineering Program)
5. Specific goals for the course
    a. The objective of this course is for mining engineering seniors to ensure that preliminary design work necessary for initiation of senior design project (in MIN 490W) is completed. Required Course.
    b. ABET Outcomes

Outcome	Role of MIN 489W
Outcome D. Ability to function on multi-disciplinary teams	The senior design project will be executed by a team where each team member will cover a different technical aspect of design. Each of the technical components has to fit as a cohesive whole, requiring team members to have the ability to achieve a multi-disciplinary goal.
Outcome G: The ability to communicate effectively in written, oral, and graphical forms.	A very important aspect of engineering is communicating the engineering approach and the resulting design. These require displaying plots and mine plans in the written reports that describe the design process in a logical manner. As this course is designated a “writing intensive” course, communication abilities (in written and graphical form) are graded frequently. Oral communication is used when the students require help from the instructor in design, interact with each other on a group project and when orally presenting their design to the department faculty and students.

Estimated ABET Category Content: Engineering 1 Credit

6. Brief list of topics to be covered: Project identification, team workload distribution, data collection and pre-processing, reporting.

MIN 490W: Mine Design Project II, Required

1. 2 credits, Weekly Meeting (by arrangement)
2. Rajive Ganguli, PhD, PE
3. Text book: None

   other supplemental materials
   Mining Engineering Handbook
   Mining Engineering, Journal
   Underground Mining Methods
   SME Code of Ethics
   AK Professional Engineering Statutes: Ethics
4. Specific course information
   a. Course Description: The students will design a mine in a group effort covering the various aspects of mine design such as ore reserve estimation, mine layout, strata control, ventilation plans, production plans, equipment selection including power requirements, permitting requirements, reclamation and closure plans and economic evaluation. This is a writing intensive course. Both MIN 489W and MIN 490W have to be completed to fulfill the "W" requirement of the program.
   b. Prerequisites: ENGL 111X; ENGL 211X or ENGL 213X or permission of instructor; MIN 301, MIN 302, MIN 370, MIN 454 and MIN 489.
   c. Required course for the BS(Mining Engineering Program)
5. Specific goals for the course
   a. The object of this course is for mining engineering seniors to apply their mining engineering knowledge to design a mine as a group project. They are then expected to present the design both in a report and in an oral presentation.

Outcome	Role of MIN 490
Outcome C. Ability to design system, component or process to meet needs	This class requires individuals to design components of a mine. Thus, they not only have to design a component, but they have to ensure that their component meshes very well with components designed by others. They have to follow a logical and robust design process.
Outcome D. Ability to function on multi-disciplinary teams	The main product of this course is a mine, designed collectively by a group of students. Each students focuses on a particular aspect of a mine.
Outcome F: An understanding of professional and ethical responsibility	Students will be expected to meet professional standards in design and reporting. They will also be required to be aware of ethical pitfalls such as disclosure of limitations.
Outcome G: The ability to communicate effectively in written, oral, and graphical forms.	A very important aspect of engineering is communicating the engineering approach and the resulting design. These require displaying plots and mine plans in the written reports that describe the design process in a logical manner. As this course is designated a "writing intensive" course, communication abilities (in written and graphical form) are graded frequently. Oral communication is used when the students require help from the instructor in design, interact with each other on a group project and when orally presenting their design to the department faculty and students.

Estimated ABET Category Content: Engineering 2 Credit

6. Topics to be covered: Mining method selection, mine design (rock mechanics, ventilation, stope design, equipment selection, economics, environmental design, ethics etc), 3D Mine Design and report.

The syllabi for additional courses in the program but not in the outcome matrix are given next.

Course Schedule and Overview

General Chemistry 1 (Chem F105X) 4.0 credits Spring 2011

Lecturer: Professor Thomas Clausen (Reichardt 188, 474-5512; tpclausen@alaska.edu) **Office Hours:** MWF 1:00-2:00 **Lecture:** MWF 2:15-3:15 pm in NSF 201 **Text:** "Chemistry and Chemical Reactivity", 7th Ed. by Kotz; Volume 1 **Lab Material:** Treichel; Townsend "Experiments in General Chemistry" (distributed via Blackboard)

Required Materials: Text, OWL access card, Turning Technologies radio frequency clicker; Non- Graphing Scientific Calculator

Course Overview: Chem 105X is the first semester of a two semester series in general chemistry. It meets the American Chemical Society requirements for a introductory course in Chemistry for Science and Engineering majors as well as UAF's core science laboratory requirement (That is what the X implies). In Chem 105X, we will cover chapters 1-11 of the Kotz text. The topics covered include 1) making scientific measurements, 2) atomic theory and atomic structure, 3) stoichiometry, 4) aqueous chemistry, 5) thermodynamics, 6) valence bond theory and molecular orbital theory, 7) introduction to organic chemistry, 8) gas laws.

Course Prerequisites: Placement in ENGL F111X or higher; placement in MATH F107X or higher; or a B or better in CHEM F103X; or permission of instructor and department chair. Students not meeting these prerequisites will be dropped from the course.

Note: A grade of "C" or better in Chem 105 is required for enrollment in Chem 106.

Additional Course Resources: See the course web page at: www.uaf.edu/chem/courses

Important Dates:

Last day to withdraw with 100% tuition refund Jan. 28 Last day to drop the course (without a "W" appearing on transcript; 50% tuition only refund) Feb. 4 Last day to withdraw from the course (a "W" will appear on transcript) Mar. 25

Chemistry Department Policy on Cheating: Any student caught cheating will be assigned a course grade of "F". The students academic advisor will be notified of this failing grade and the student will not be allowed to drop the course.

Honor Code:

As a UAF student, you are subject to the Honor Code. The university assumes that the integrity of each student and of the student body as a whole will be upheld. Honesty is a primary responsibility of you and every other UAF student. It is your responsibility to help maintain the integrity of the student community. UAF's Honor Code is as follows:

1) Students will not collaborate on any quizzes, in-class exams, or take-home exams that will contribute to their grade in a course, unless permission is granted by the instructor of the course. Only those materials permitted by the instructor may be used to assist in quizzes and examinations.

2) Students will not represent the work of others as their own. A student will attribute the source of information not original with himself or herself (direct quotes or paraphrases) in compositions, theses and other reports. 3) No work submitted for one course may be submitted for credit in another course without the explicit approval of both instructors. Violations of the Honor Code will result in a failing grade for the assignment and, ordinarily, for the course in which the violation occurred. Moreover, violation of the Honor Code may result in suspension or expulsion.

Instructor's Expectations: Your attendance and attention (no sleeping!!!) at lecture are expected. Please be respectful of other students. Arrive on time and conduct yourself in a business-like and professional manner. If you arrive late, please enter at the back of the auditorium. Have cell phones turned off unless you are expecting an emergency phone call.

Homework (Active Learning): Homework assignments will be executed using a computerized system called OWL (On-line Web-based Learning). OWL will post assignment deadlines and store homework grades automatically. Students are responsible for keeping track of assignment deadlines. Success in Chem 105 requires practice doing problems. Higher achievement on exams is usually a direct result of time spent doing homework assignments in their entirety.

Each OWL homework set will have a list of "optional" and "required" problems. The optional problems will not be used in calculating your final grade. You need only "master" four (4) required units per chapter to obtain 100% credit; doing more than the four required units is strongly encouraged but will not be used in your grade calculation. The following rules apply:

- Units must be mastered before the due date for credit; there will be no extensions granted

You have two (2) attempts to master a unit. Note that once you open a unit, that will be considered an attempt regardless of whether you proceed with the problem.

OWL will provide excellent feedback on how to solve the problem. Be sure to fully understand the feedback on any missed unit before you proceed with your second and final attempt.

You may make up an unmastered unit by either: ☐ mastering another "required" unit in the same homework set on time mastering three additional units from any chapter. There is no restriction on the number of attempts or due dates in doing these

additional units other than they must be done by the last day of classes.

Clickers: We will use classroom response systems (clickers) to take attendance and to ask questions periodically throughout lectures. On days I may opt for a graded quiz using clickers rather than collect notes (see below). ALWAYS BRING YOUR CLICKER TO CLASS.

To register your clicker, send me an email (tpclausen@alaska.edu) with your name and the 6-digit code that is under the bar code on the back of your clicker. **Students failing to register for OWL or failing to register their clicker by Jan. 31st will be dropped from the course for failure to participate in the course.**

Calculators: Always bring your **non-graphing** calculator to class.

Notes from reading assignments: Lectures are much more valuable when you arrive prepared. One good way to do so is to study the text material prior to the lectures. I will expect to find evidence that you have done this by collecting notes prior to each lecture for the reading assignments. The following rules apply:

- Notes are to be turned in at the start of lecture
- Clearly state at the start of your notes your name and what sections of the text are being covered.
- Notes are to be original hand written. No Xerox or electronic versions will be accepted
- Notes will be graded on
  - neatness (3pts for very good; 2 pts for adequate; 1 pt for subpar)
  - penmanship
  - organization (no clutter)
  - standard paper (8.5 x 11 inch) and not torn from a spiral notebook
- Content (9pts. I will randomly choose three items from the following categories and give up to 3 points per item)
  - key definitions
  - important concepts
  - key mathematical relationships in which each term is defined as well as the numerical value of constants with their units
  - Balanced chemical reactions that have clearly important implications for society or the environment (Haber process; acid rain, sulfuric acid production…). Be sure to briefly state why the reaction is important.
  - Worked in-chapter problems
  - In-chapter stories (" a closer look"; "chemical perspectives", "case-studies"…).

    I will strive to have your notes returned to you in the following class period.

In some cases I may choose to have a graded clicker quiz instead of collecting notes. In these instances, the quiz will be open note but closed book.

Exams: There are three scheduled in-class hour exams during the semester plus a cumulative final. All exams count toward your grade; **there are no dropped or make-up exams**. If you can anticipate an absence, talk to me before the exam to make arrangements. If the absence is unexpected (illness, transportation problems, jail time…), contact me *ASAP* by phone or email to see if anything can be done. **Do <u>not</u> wait until the next class to speak with me about a missed exam**.

Laboratory: An important component of Chem 105 is a weekly three-hour laboratory session. The purpose of the lab is to reinforce lecture concepts through hands-on investigation. Lab sessions help students to learn about the safe handling of chemicals and the use of common lab equipment. In addition, students are introduced to the concepts of scientific reasoning and experimental design. The labs will be supervised by graduate and upper division undergraduate teaching assistants. Teaching assistants will have specific office hours during which they will be available to answer questions related to the lab assignments. More than 10 experiments are scheduled during the semester. The laboratory portion of your grade will be based on the average of your best 10 lab reports (Note that the first two lab sessions are required for all students). All students enrolled in Chem 105 must attend laboratory. **Students completing (including turning in reports)**

fewer than 8 lab exercises will fail the entire course. Lab reports will be handed in each week, to be graded and returned by the teaching assistants. Lab reports are due one week after a lab is completed. Late lab reports will not receive full credit. Your lab TA will explain the penalties for late lab reports.
American Chemical Society Standardized Placement Exam: During the first week of laboratory (Jan. 24 – 28), a multiple choice placement examination will be given. This exam does NOT count toward your grade, but taking this exam is mandatory. **Any student who does not take this exam will be dropped from the enrollment.** You will be given 45 minutes to answer 44 questions.
Note: The first scheduled lab exercise (Safety Lab) is scheduled for the week of Jan 31 – Feb 4. **Attendance at the safety lab is mandatory**. **You may not continue in the course unless you have attended and turned in the write-up for the safety lab.**

Grading: Your knowledge of the course content will be assessed via a combination of exams, homework, laboratory and in-class exercises. Points for the various exercises will be assigned as shown below.

3 Hour exams @ 100 points each 300 pts
Final exam 100 pts
OWL (homework) 100 pts
Laboratory Total 100 pts
Notes (or quizzes) 100 pts
700 pts

Total point percentages of 90, 80, 70 and 60 correspond to the lower cutoff boundaries for the grades of A, B, C and D respectively. Plus / minus grades will not be assigned. Percentages less than 60 constitute a failing grade ("F").
Note: Students completing (including turning in reports) fewer than 8 lab exercises will receive an "F" for the entire course regardless of how they are doing in the rest of the course. If absenteeism is due to a documented illness or other accepted reasons, an incomplete may be considered.

Student Responsibilities:
Students are responsible for all material covered in class lecture. If you miss class for any reason, you will need to find out what you missed (generally, this is best accomplished by asking another student in the course for class notes). Students are responsible for reading the assigned material in the text ***before*** coming to class. Clicker questions will be based on reading assignments. Check your email regularly for updates and regularly check and adhere to the due dates for new OWL assignments. Students should keep all returned, graded assignments until after final course grades have been posted on UAonline.
Be sure to come to labs on time, prepared (having completed the prelab) and properly attired. There will be a host of safety rules (eye protection is required, no eating / drinking in lab, no unauthorized visitors…) that will be strictly enforced by the laboratory coordinator, Emily Reiter (e.reiter@alaska.edu; 474-6748). In addition, make sure all lab reports are in your own words; plagiarism is a serious offense!

Course Goals
Students should exit the course with the following skills:

- ☐ quantitative dilution problems
- ☐ an introductory level of understanding of the scientific method
- ☐ an introductory level of understanding of chemical nomenclature
- ☐ an introductory level of understanding of atomic structure
- ☐ an introductory level of understanding of chemical bonding and reactions (redox, acid/base, precipitation, gas formation & combustion)
- ☐ an introductory level of understanding of chemical energetics
- ☐ an introductory level of understanding of gas laws

Student Learning Outcomes
Student learning outcomes will be assessed via an assessment exam given at the beginning and end of the semester and a standardized final exam.

Disability Services (http://www.uaf.edu/disability/index.html)
Students with a physical or learning disability, who may need academic accommodations, should contact the Disability Services office, located in the
Center for Health and Counseling (474-5655, TTY 474-1827, fax: 474-5688.) You will need to provide documentation of your disability. Disability Services
will then notify the instructor of any special accommodations required for students with documented learning disabilities.

Chemistry 105 Lab Schedule Spring 2011

Week	Dates	Laboratory Experiments
1	Jan 24-28	American Chemical Society Standardized Placement Exam (**Mandatory Attendance)**
2	Jan 31- Feb 4	Safety Lab (**Mandatory Attendance)**
3	Feb 7-11	Intro to Lab Techniques
4	Feb 14-18	Reactions in Aqueous Solution
5	Feb 21-25	ID of an Unknown Substance
6	Feb 28-Mar 4	Cycle of Copper Reactions
7	Mar 7-11	Enthalpy of Neutralization
8	Mar 14-18	**No Lab** (Spring Break)
9	Mar 21-25	Intro to Spectroscopy
10	Mar 28-Apr 1	Spectroscopy & Water Hardness
11	Apr 4-8	Isotopes and GC/MS
12	Apr 11-15	Computational Chemistry
13	Apr 18-22	Synthetic Chemistry (Aspirin)
14	Apr 25-29	Standardized post-test **Mandatory Attendance** (Extra Credit will be awarded for this exercise)

1-19-2011

Chemistry 106X General Chemistry II Spring Semester 2011

Instructor: Dr. John Keller (Office: 161 NSF; Tel 474-6042, email jwkeller@alaska.edu)
Laboratory Director: Emily Reiter (Office 194A NSF; Tel 474-6748; email e.reiter@alaska.edu)
and Teaching Assistant Supervisor
Administrative Assistant: Mist D'June-Gussak .Office 194 NSF; Tel 474-5510; email mist@alaska.edu)
Class Meeting: TR, 6:30-8:00 PM 201 Reichardt
JK Office Hours: TR 8-9 PM; others by appointment

Resources

Required Materials:

1) *Chemistry and Chemical Reactivity 7th Ed.*; Kotz, Treichel, and Townsend, Brooks/Cole; 2009 Volume 2 (ISBN 978-0-495-38712-6) or Complete text 7th Ed. (ISBN 978-0-495-38703-9) or e-Book
2) Access to Chapter 10 (Organic Chemistry), Kotz et al 7th Ed. Either in Vol. 1, or via e-Chapter from http://www.cengagebrain.com/shop/ISBN/9780495387039?cid=APL1 ($8.49)
3) OWL access card for *Chemistry and Chemical Reactivity 7th Ed* (1-semester or 2-semester)
4) A Turning Technologies ResponseCard RF radio frequency clicker. (new or used OK)
5) *Experiments in General Chemistry 106X: A Laboratory Manual* (Free! available on Blackboard website.)
6) American Chemical Society (ACS) General Chemistry Study Guide
7) A non-programmable non-graphing scientific calculator is required for **each exam**. N.B. The Department of Chemistry and Biochemistry does not provide calculators in exams. You must provide your own.

Please do **not** bring a graphing and/or programmable calculator such as a TI-83 to Chem 106X exams.

Optional Texts:
Chemistry & Chemical Reactivity - Student Solutions Manual. Kotz *Chemistry & Chemical Reactivity - Study Guide*. Kotz *Essential Algebra for Chemistry Students, 2nd Ed*. David W. Ball.

Email communication. All messages will be sent to student UAF email address (like alincoln44@alaska.edu). According to UAF policy, it is the student's responsibility to read or monitor this email account.

Course Overview: Chemistry 106X is the 2nd semester of a two-semester series in general chemistry, which deals with a variety of microscopic and macroscopic chemical phenomena. These courses emphasize the quantitative, mathematical (but mostly non-calculus based) chemistry. Chem 106X covers chapters 10, 12-20, 2223 of the text. A schedule of lecture topics and assignments is provided on another sheet. Chem 106X satisfies UAF's Core Curriculum in science (that is what the "X" refers to).

Course Goals and Student Learning Outcomes: The goals for this course are to enhance your skills in critical reading, problem-solving, laboratory experimentation, communication of information, self-confidence, and self-reliance.

Chem 106X Homepage: http://chem.uaf.edu/keller/Courses/106Sp11/ The homepage includes links to the syllabus, lecture schedule, practice exams and solutions, copy of lecture notes, and others. There may also be materials, information, and grades available at the Blackboard site for this course (http://classes.uaf.edu/)

Online Web Learning (OWL): Homework problems will be done using the OWL system. The link to the OWL

registration page is shown below or can be found on the course homepage. You must obtain an OWL card at the bookstore or online. 1/7 of your grade is based on OWL homework.

OWL: Make sure you register for "Chem106X Spr 2011 EVE" . More instructions in the use of OWL will be given in class. OWL questions will be due 1-to-3 days after the chapter has been discussed in class, generally twice weekly. Students will have **6 chances** to solve assignment questions. At the end of the semester, your total OWL points on required questions will be scaled to 80 points and added to the semester total.
"Active learning" means DOING something with your **hands and brain** to put into practice a concept you have just read or heard about. Do a problem related to the reading you have just done. You will learn a lot more, a lot faster, if you DO something after you read or think about it. In class, TAKE NOTES! During the weekly lectures, we will do occasional "clicker questions", which are multiple-choice questions that you answer with your clicker. If you have been following the lecture, and doing some pre-study, these should not be too hard. Some will be easy, and some will be challenging. Other avenues for active learning are doing OWL, in-chapter Exercises, or end-of-chapter Study Questions. The *answers* to the odd-numbered end-of-the-chapter questions may be found in Appendix O of the text. The *stepwise solutions* to the odd-numbered questions are in the *Student Solutions Manual*.

Policies

Prerequisites: (UAF Catalogue): "C grade or better in Chem 105X; placement in Eng 111X or higher; placement in Math 107X or higher; or permission of instructor and department chair."

Classroom Expectations of Students: JK expects you to attend class, and will check your attendance using clicker scores (see below). Each day BEFORE class, the student should read the portion of the textbook that is assigned on the schedule, and begin to work with the assigned OWL questions (see assignment sheet). With this preparation, you will better be able to understand the discussion, ask questions, and answer "clicker questions" (see below). Please conduct yourself in a business-like and professional manner. Be respectful of the rights other students to a quiet and uninterrupted learning experience. If you arrive late, please enter at the *back* of the auditorium (2nd floor level). **Turn off your cell phone ringer. Put away your laptop. Be quiet. Listen**.

"Clickers": Student clicker responses are recorded electronically by the TurningPoint receiver and software on JK's laptop. Questions will be graded 1 point for an answer, 0 points for no answer. The percent maximum score at the end of the semester will be multiplied by 70 pts and included in the semester total. **About 50 questions will be asked this semester. You will be allowed 5 to 10 zero clicker scores without penalty, to take into account the (hopefully few) days you miss class due to travel on University business, sickness, or your clicker batteries ran down, or other legitimate causes.** No "makeup clicker questions" will be given. No answers on paper can be accepted.

It is the student's responsibility to bring the clicker to each class, take care of it, replace it if lost, and keep it supplied with fresh batteries (they should last the whole semester with normal usage).
"Clicker by proxy" is a no-no. **Click only you own clicker!**
Register your clicker ID on the OWL website. Go "Clicker Registration" in the Support & Miscellaneous panel on the left had side. **To gain credit on the very first clicker question**,
your clicker ID must be registered by MONDAY, Jan. 31, 6:00 PM.
If you miss that deadline, then send your clicker ID to JK as soon as possible.

Laboratory: The purpose of the lab is to do hands-on investigation. We expect you to gain skills in scientific reasoning, experimental design, and use of chemicals and laboratory apparatus. The labs are conducted by graduate and upper division undergraduate teaching assistants. Lab reports will be handed in each week, to be graded and returned by the teaching assistant. 11 experiments are scheduled for the semester. The

laboratory portion of your grade (100 points) will be based upon the average of your best 10 out of 11 lab grades. You can miss one lab with no impact on your lab grade. If you miss 2 or 3 labs, then 1 or 2 zeros respectively will be included in the average. **Do not miss 4 labs: this results in a COURSE F!**

All students enrolled in Chem 106X (even those who have taken the course before) must attend laboratory. **Students must hand in <u>8 or more</u> reports to earn a passing grade in this course. In other words, if you hand in only 7 (or fewer) lab reports, an F grade in the course is assigned, even if all your other grades are passing.** This stiff requirement is based on the American Chemical Society stipulation that students must spend a certain number of hours in lab for courses such as Chem 106X (and of course you must attend lab in order to write a lab report!) There are no make-up labs scheduled during the semester. If you have special scheduling problems or if you miss more than one lab for an acceptable reason, please discuss alternative plans with Emily Reiter, Laboratory Director. Laboratory reports are due one week after a lab is completed. Late reports will be accepted, but the score will be reduced significantly. The last report of the semester cannot be accepted late.

Exams: The student is responsible for all information from text, lecture, OWL, and assigned study questions. Questions from any of these sources may appear on exams. Three 90-minute exams and a cumulative final exam will be given; see the weekly schedule for dates and coverage. Each exam will include a table containing all necessary constants, and a simple periodic table.

Final Exam. The final exam will be a 120-min, 70-item multiple choice exam provided by the American Chemical Society Examinations Institute. This covers the 2nd half of the text plus organic chemistry. The required review text is an excellent source of information and will help you practice and prepare for this exam, which should be no more difficult than the other exams during the semester. **The time (Tues, May 10, 8-10 PM) and place (201 Reichardt) of the final exam have been set by the UAF Registrar, not your professor. No early or late exams can be scheduled. If you miss the scheduled exam due to travel, then the University policy on Incomplete (I) grades will be invoked.**

Make-up exams will be allowed for good reasons, which you MUST DISCUSS with the professor. "I slept in" is not a good reason. (But: if you are late, or even *very* late, to the exam, make the effort to come in: we can accommodate you.) An unexplained absence from an exam results in a zero. If you anticipate an absence (intercollegiate sports, travel on military or University business), talk to your professor ***<u>before</u>*** the exam to make arrangements. If the absence is unexpected (illness, family or personal calamity, cold weather transportation difficulty), talk with the professor at the earliest possible opportunity. Come prepared to **document** your particular calamity. In any case, you must take the makeup exam within 1 week of your return to health. **If you are to take a makeup exam, we expect that you have no knowledge of the original exam**.

Ethical Considerations: As a UAF student, you are subject to the UA Honor Code, which says in part:

"Students will not collaborate on any quizzes, in-class exams, or take-home exams that will contribute to their grade in a course, unless permission is granted by the instructor of the course. Only those materials permitted by the instructor may be used to assist in quizzes and examinations.

Students will not represent the work of others as their own. A student will attribute the source of information not original with himself or herself (direct quotes or paraphrases) in compositions, theses, and other reports. No work submitted for one course may be submitted for credit in another course without the explicit approval of both instructors. Violations of the Honor Code will result in a failing grade for the assignment and, ordinarily, for the course in which the violation occurred. Moreover, violation of the Honor Code may result in suspension or expulsion."

Other banned activities: Using another student's clicker; copying answers on lab reports or exams.

The Chemistry "Department Policy on Cheating" is the following: "Any student caught cheating will be assigned

a course grade of F. The student's academic advisor will be notified of this failing grade and the student will not be allowed to drop the course."

During hour and final exams programmable and/or graphing calculators, cell phones, beepers, PDAs, and other electronic devices are NOT allowed on your person. Power-off any such item, and place it inside your closed briefcase, purse, or pack at the back of the room, or on the floor.
Grading Estimated Grade Scale (as % of 650 pts). (Subject to change):

Item	**Maximum Pts**
Exam 1	100
Exam 2	100
Exam 3	100
Final Exam	100
OWL Homework	80
Clicker score	70
Lab	100
Total	**650**

%	**Letter Grade**
88-99%	A
77-88%	B
66-77%	C
55-66%	D
Less than 55%	F

Grades. Letter grades (A-F, no +/- grades) are assigned based on the total out of 650 points accrued in the semester. The approximate cut-offs for letter grades are shown above. These are *estimates only* based on prior semester results, and are subject to change up or down at the time final grades are assigned. The final cut-offs may differ from other C 106 sections because the exams, OWL and clicker questions are different.

Instructor-Initiated Withdrawals: Any time up to and including Friday, March 28, the professor has the right to withdraw a student from Chem 106X for any of the following reasons: (1) Exam I and II are missed without an excused absence, or (2) two or more labs are missed, or (3) the student shows poor class attendance, or (4) is missing a lot of OWL homework. This is our definition of "...has not participated substantially in the course. (See p. 44 in the Catalog.)

Disabilities: Students with physical or learning disabilities are required to identify themselves to Mary Matthews in the Disability Services office, located in the Center for Health and Counseling (474-7043). The student must provide documentation of the disability. Disability Services will then notify Prof. Keller of special arrangements for taking tests, working homework assignments, and doing lab work.

Incomplete (I) grade: A grade of "I" is assigned only when a student misses the final exam or

multiple laboratory classes for a documentable reason, such as a medical problem, a death in the family, etc.

Important Dates: Please keep the following dates in mind.

Last day to drop class and get 100% refund ..... Friday, Jan. 28
Last day to drop class w 50% refund (course not on academic record) ..... Friday, Feb. 4
Freshmen progress reports due ..... Friday, Feb. 25
Last day for student- or instructor- withdrawal (“W” on academic record) ..... Friday, Mar. 25
UAF SpringFest (no classes) ..... Friday, April 29
Last of instruction: ..... Friday, May 6

Physics 211

General Physics
Fall 2010

Instructor: David Newman
Office: 112 NSCI
Office Phone: 474-7858
Home Phone: 458-8576 (if all else fails!! But please not after 11 PM)
Email: denewman@alaska.edu
Office Hours:
Monday 3:30-5:30pm in 112 NSCI
Wednesday 11:30-1:30pm in 112 NSCI
Additionally, a help room will be staffed to answer homework related questions. This will be in the Physics conference room (122NSF) and will be staffed at various times each day (the schedule is posted on the Rm122 door).

This syllabus is located at: http://ffden-2.phys.uaf.edu/211_fall_2010.html

Course Syllabus

In approaching this (and all) classes, please note the following ancient chinese proverb:

Teachers can open the door,
but you must enter by yourself.

Course Content: In the first part of the course you will learn the basic language of physics including measurement and how we discuss and quantify motion. We will then move on to calculating the motion of bodies which will lead us into the wonder of Newton's 3 laws of motion. You will learn to love them (or at least learn them) and their applications to such a wide range of problems such as fair rides, space ships, skidding cars and even hanging signs. Then the course will explore energy and momentum, two of the most important and powerful concepts in the physics of motion. This will be followed by an introduction into Gravitation followed by fluid mechanics. This will then lead into a discussion of waves including sound wave and such cool things as noise canceling headphones. Most importantly, you will learn to impress your friends and relatives with your knowledge of the universe (or bore them to tears), so be prepared for being introduced to "*The Power of Physics*".

Prerequisites: Calculus and high school physics. Algebra, trigonometry and calculus will be used extensively.
Materials Needed:

Required Text:	*University Physics*, Bauer and Westfall
Calculators:	No calculators may be used during exams or quizzes. Otherwise, buy yourself a nice one. A basic, simple scientific calculator with trigonometric, exponential, and logarithmic functions is all that you need.

Lectures: 10:30am MWF in 201A NSCI. *The lectures supplement but do not substitute for the reading.* Lectures will cover the major topics, emphasizing and discussing the important points. They are not sessions to

regurgitate material already written in the text. Your personal participation is important, and it is critical that you read the assigned material before lecture. Time permitting, several Friday lectures will cover special topics beyond the scope of the text. These will be announced before hand.

Homework: There will be approximately one homework assignment per week. The assignment will be given out (and posted on the web and in the hall in front of my office) on Wednesdays and will be due in on the following Thursday by 5:00PM. Place your homework in the appropriate box in the Physics Department Office. You are encouraged to work with others on the homework, but make sure the paper you turn in is not simply copied from someone else. These assignments help me assess your understanding of the material, and will count toward your final grade.

Late problem sets will not be accepted.

Only a selection of problems will be graded each week, totaling about 25-30 points each.

Quizzes: 6 short quizzes will be given in class during the semester. They will be closed book and no calculators allowed (or needed). All difficult formulas needed will be given and the quiz will be similar to some of the recent homework or topics covered in class. The quizzes will be announced in class and on the schedule page at least one week in advance.

Project: There will be a project due worth a maximum of approximately 10% of the course grade. The project will be in the form of a web page on a topic in physics that you find interesting and we agree on together. These topics could include biographies of important scientists, scientific projects and scientific ideas. The topic must be agreed to by Oct 6th and must be competed by Nov 24th. They will be graded both for presentation and content. More details will be discussed in class and on the web project link above.

Labs: There is a lab associated with this course. **ALL** labs and reports must be completed to get a passing grade for the lab.

A PASSING GRADE IN THE LAB IS NECESSARY TO PASS THE COURSE.

Labs may only be made up if excused and with permission of the course instructor. Questions about the lab should be directed to the teaching assistant in charge of your lab or as a last resort me.

Hour Exams: Exams will be given during the Friday(or monday) lecture as follows:

```
        Oct. 8, approx. Chapters 1-5
        Nov 12, approx. Chapters 6-11
The exams will be closed-book, but you will be given one side of
an 8 1/2 x 11-inch sheet with most of the needed equations. No
calculators are allowed. The exams will be graded and handed back as
soon as possible. Solutions will be discussed.
```

Final Exam: The final exam will be at 10:15 a.m. - 12:15 p.m., Friday, Dec. 17. It will cover the entire course (Chapters 1-16), with some emphasis on the more recent material. The final will be closed-book, but you will be given two sides of an 8 1/2 x 11-inch sheet with most of the needed equations.

Grading: The course grade will consist of the following components (though I reserve the right to make grade adjustments based on performance trends):

```
        2 hour exams   30 %
        Final exam     25 %
        Homework       10 %
        Quizzes        10 %
        Project        10 %
        Lab            15 %
```

I grade on a curve however to satisfy university requirments, above 95% will be at least an A, above 85% will be at least a B above 75% will be at least a C, above 65% will be at least a D (in most cases the actual curve is significently lower!).

Contacting Me: I have office hours as listed above. You can drop by at other times if I'm not busy, or make an appointment. I am (almost) *never* available before class.

Special Needs: The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. We will work with the Office of Disabilities Services (203 WHIT, 474-7043) to provide reasonable accommodation to students with disabilities.

Plagiarism etc: Plagiarism and cheating are matters of serious concern for students and academic institutions. This is true in this class as well. The UAF Honor Code (or Student Code of Conduct) defines academic standards expected at the University of Alaska Fairbanks which will be followed in this class. (Taken from the UAF plagiarism web site, which has many links with good information about this topic)

Complaints and Concerns: You are always welcome to talk to me about anything, however, if you have a non-subject matter question or concern that cannot be resolved by me, contact the department chair, Dr. Chowdury, Physics Department Office, room 102 NSCI.

Alternate References: To see the same topics explained differently, try the following:

Physics for Scientists and Engineers, Serway and Jewett.

Fundementals of Physics, 8th edition, Halliday Renick and Walker.

The Feynman Lectures on Physics, Richard Feynman (a great set of books...but rather deep)

Here is a good web site on how to study physics which might be of

interest and use: How to study physics

General Advice: Physics is not something you read and memorize, rather it is something you learn how to do. Try the following study procedure:

1. Read the chapter prior to lecture, so that you will know what it's about.
2. Listen carefully to the lecture and take notes.
3. This is crucial: *Do not go back and read and re-read* the chapter until you "understand it." Rather, start working problems, going back through the chapter to clarify points as they come up. I suggest you try to answer all "Checkpoint" problems in the text and the questions at the end of the chapter. If you understand these, you've probably understood the salient points of the chapter.
4. Think! Don't simply try to fit the problems into the form of another problem, think through the problem first.
5. **Interesting Physics computer demos**

Physics 212

General Physics
Fall 2009

Instructor: David Newman
Office: 112 NSCI
Office Phone: 474-7858
Home Phone: 458-8576 (if all else fails!! But please not after 11 PM)
Email: ffden@uaf.edu
Office Hours:
Monday 3:30-5:00pm in 112 NSCI
Wednesday 11:30-1:30pm in 112 NSCI
Additionally, a help room will be staffed to answer homework related questions. This will be in the Physics conference room (122NSF) and will be staffed at various times each day (the schedule is posted on the Rm122 door).

This syllabus is located at: http://ffden-2.phys.uaf.edu/212_fall_2009.html

Course Syllabus

Course Content: In the first part of the course you will learn basic thermodynamics including the 3 laws of thermodynamics and applications to such diverse problems as temperature, the efficiency of engines and the ultimate fate of the universe. Then the course will explore electricity and magnetism. We will start by discussing electrostatics followed by DC circuits and magnetostatics. Then we will talk about the interactions between electric fields and magnetic fields which will lead to AC circuits. We will then end the semester with an introduction to Electromagnetic waves. Most importantly, you are also very likely to learn to impress your friends with your knowledge of the universe (or bore them to tears), so be prepared for being introduced to "*The Power of Physics*".
Prerequisites: Calculus, high school physics and Physics 211. Algebra, trigonometry and calculus will be used extensively.
Materials Needed:

Required Text:	*Fundementals of Physics*, 8th edition, Halliday Renick and Walker.
Calculators:	No calculators may be used during exams or quizzes. Otherwise, buy yourself a nice one. A basic, simple scientific calculator with trigonometric, exponential, and logarithmic functions is all that you need.

Lectures: 5:50pm MWF in 201A NSCI. *The lectures supplement but do not substitute for the reading.* Lectures will cover the major topics, emphasizing and discussing the important points. They are not sessions to regurgitate material already written in the text. Your personal participation is important, and it is critical that you read the assigned material before lecture. Time permitting, several Friday lectures will cover special topics beyond the scope of the text. These will be announced before hand.
Homework: There will be approximately one homework assignment per week. The assignment will be given out (and posted on the web and in the hall in front of my office) on Wednesdays and will be due in on the following Thursday by 5:00PM. Place your homework in the appropriate box in the Physics Department Office. You are encouraged to work with others on the homework, but make sure the paper you turn in is not simply copied from someone else. These assignments help me assess your understanding of the material, and will count toward your final grade.

Late problem sets will not be accepted.
Only a selection of problems will be graded each week, totaling about 25-30 points each.
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Labs: There is a lab associated with this course. **ALL** labs and reports must be completed to get a passing grade for the lab.
A PASSING GRADE IN THE LAB IS NECESSARY TO PASS THE COURSE.
Labs may only be made up if excused and with permission of the course instructor. Questions about the lab should be directed to the teaching assistant in charge of your lab or as a last resort me.
Hour Exams: Exams will be given during the Friday(or monday) lecture as follows:

```
Oct. 9, approx. Chapters 18-22
Nov 13, approx. Chapters 23-28
```

The exams will be closed-book, but you will be given one side of an 8 1/2 x 11-inch sheet with most of the needed equations. No calculators are allowed. The exams will be graded and handed back as soon as possible. Solutions will be discussed.
Final Exam: The final exam will be at 5:45-7:45 pm on Fri, Dec 18. It will cover the entire course (Chapters 18-33), with some emphasis on the more recent material. The final will be closed-book, but you will be given two sides of an 8 1/2 x 11-inch sheet with most of the needed equations.
Grading: The course grade will consist of the following components (though I reserve the right to make grade adjustments based on performance trends):

```
2 hour exams   30 %
Final exam     25 %
Homework       10 %
Quizzes        10 %
Project        10 %
Lab            15 %
```

I grade on a curve however to satisfy university requirments, above 95% will be at least an A, above 85% will be at least a B above 75% will be at least a C, above 65% will be at least a D (in most cases the actual curve is significently lower!).
Contacting Me: I have office hours as listed above. You can drop by at other times if I'm not busy, or make an appointment. I am (almost) *never* available before class.
Special Needs: The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. We will work with the Office of Disabilities Services (203 WHIT, 474-5655) to provide reasonable accommodation to students with disabilities.
Plagiarism etc: Plagiarism and cheating are matters of serious concern for students and academic institutions. This is true in this class as well. The UAF Honor Code (or Student Code of Conduct) defines academic standards expected at the University of Alaska Fairbanks which will be followed in this class. (Taken from the UAF plagiarism web site, which has many links with good information about this topic)
Complaints and Concerns: You are always welcome to talk to me about anything, however, if you have a non-subject matter question or concern that cannot be resolved by me contact the department chair, Dr. Olson, Physics Department Office, room 102 NSCI.

Alternate References: To see the same topics explained differently, try the following:
Fundamentals of Physics, 5th or 6th edition, Halliday, Resnick, Walker (similar to Serway) *The Feynman Lectures on Physics*, Richard Feynman (a great set of books...but rather deep)

Here is a good web site on how to study physics which might be of interest and use: How to study physics

General Advice: Physics is not something you read and memorize, rather it is something you learn how to do. Try the following study procedure:

1. Read the chapter prior to lecture, so that you will know what it's about.
2. Listen carefully to the lecture and take notes.
3. This is crucial: *Do not go back and read and re-read* the chapter until you "understand it." Rather, start working problems, going back through the chapter to clarify points as they come up. I suggest you try to answer all "Checkpoint" problems in the text and the questions at the end of the chapter. If you understand these, you've probably understood the salient points of the chapter.
4. Think! Don't simply try to fit the problems into the form of another problem, think through the problem first.
5. **Interesting Physics computer demos**

Calculus I (MATH F200X) Spring 2011

Instructor: Dr. Leah Berman

Office: Chapman 303A

Office Phone: 907-474-7123

Cell Phone: 907-347-4021 (don't call after 9 PM)

e-mail: `lwberman@alaska.edu` (best way to contact me!)

AIM screen name: leahwrenn

Teaching Assistant: Kevin Joyce, `ktjoyce@alaska.edu`

Classroom and class meeting times:
11:45 am - 12:45 pm, MWF, Ernest Gruening Building 208
11:30 am - 12:30 pm , Th, Duckering Building 252

Recitation:

- Section F04: 2:00 pm - 3:00 pm, T, Duckering Building 352
- Section F05: 3:40 pm - 4:40 pm, T, Sydney Chapman Building 106
- Section F06: 5:20 pm - 6:20 pm, T, Ernest Gruening Building 208

Office hours: 10 – 11 MWF, 9:30 – 10:30 Th, and by appointment. To make an appointment, just drop me an e-mail. You are also welcome to stop by my office at any time and see if I am free (even without a scheduled appointment); however, there is a possibility that I may be busy/away if you haven't set up an appointment. These office hours are subject to change.

Prerequisites: A grade of C or better in MATH F107 (Functions for Calculus) and MATH F108 (Trigonometry), or appropriate placement test scores.

Course description, goals, student learning outcomes: This course is the first course in the calculus sequence. We will cover: limits and continuity, differentiation and tangent lines, applications of the derivative, integration, and applications of integration.

Goals: (1) to develop the theory of the derivative and integral; to develop an understanding of what these concepts are and what they mean, and how they are constructed. (2) To gain computational skill with these concepts. (3) To understand how and why to apply these concepts as tools to help solve a wide range of problems from other fields, including physics, biology, chemistry and business.

Required Text: *Calculus, Early Transcendentals*, 6th ed. by James Stewart, ISBN 10: 0-495-45829-5

Instructional methods:

Lecture: Class meets five times a week; there are four lecture hours and one recitation hour per week. The lecture will be primarily active lectures, supplemented with the occasional in-class worksheet. You are expected to participate in the lecture by asking questions! I will call on people at random during class.

Recitation: There is a recitation section once a week, led by our Teaching Assistant, Kevin Joyce. Attendance at the recitation section is mandatory. Quizzes and worksheets will be given during the recitation section. In addition, there will usually be time to ask questions.

Homework: Homework will be assigned on a regular basis; it will be posted on Blackboard, and you will be responsible for checking often. Homework assignments will not be announced in class.

Online Homework: You will be responsible for completing online homework exercises, similar to problems from your textbook, using a program called `WebAssign`. These problems are short answer and (except for true/false questions) you get multiple attempts with no penalty and

immediate feedback. They are graded right or wrong, no partial credit. This tool is great for practicing routine computational skills. These exercises will be due basically every day.

Class Keys for WebAssign:

- Section F04: uaf 6500 5653
- Section F05: uaf 4031 1377
- Section F06: uaf 3208 4585

Written Homework: There will be weekly written homework assignments, typically due on Wednesday. These are due at the end of class on the assigned date. No late homework assignments will be accepted.

You are encouraged to collaborate with your classmates on homework, but **you must indicate the names of the people with whom you collaborated.** All homework must be written up individually. You may find working on your homework in the Math Lab, Chapman 305, is useful; there you can get questions answered, free of charge.

Draconian homework writeup instructions: As with other classes where you are turning in written material, you are expected to turn in final drafts, not first drafts! Homework must be written *neatly and legibly*, **ideally in pen**, *with lots of white space*. Please write only on one side of the page. Leave plenty of white space so that your solution is easy to read. Your homework assignments *must be stapled*.

Proficiency tests: There will be two proficiency tests, one on limits and one on derivatives. These will initially be given during Recitation, **as announced**, after we have covered the appropriate sections. Each proficiency test is worth **5%** of your grade! If you pass on the first try (you score $\geq 80\%$) you will receive that score. If you do not pass (you score $< 80\%$) on the first try, you may retake the test up to four more times, scheduled outside of class. When on one of these subsequent tries you score at least 80%, you will receive a score of 80% for the proficiency test. If you do not ever pass the proficiency test, then you may receive a score of 0 for that test.

Quizzes: There will be occasional 30 minute quizzes, administered during the Recitation section, as announced.

Exams: There will be three in-class exams. These are tentatively scheduled for Wednesday February 16, Wednesday, March 23, and Wednesday, April 20. There will be one final exam, scheduled for 10:15 a.m. – 12:15 p.m., Wednesday, May 11.

Tentative schedule: (subject to change)

Week beginning	Sections	Other info
(Jan 20)	1.1 – 1.2	
Jan 24	1.3 – 2.2	
Jan 31	2.2, 2.3, 2.5	Friday last day to add/drop
Feb 7	2.6 – 3.1	Limit prof. quiz probably this week
Feb 14	3.2 – 3.3	Exam 1 on Wednesday
Feb 21	3.4 – 3.6	
Feb 28	3.6 – 3.9	Deriv. prof. quiz probably this week
Mar 7	3.9 – 4.1	
Mar 14		Spring break (no class)
Mar 21	4.2 – 4.3	Exam 2 on Wednesday; Friday is last day to drop with W
Mar 28	4.4 – 4.7	
Apr 4	4.7 – 5.1	
Apr 11	5.1 – 5.3	
Apr 18	5.4 – 5.5	Exam 3 on Wednesday
Apr 25	6.1 – 6.2	SpringFest on Friday (no class)
May 2	6.3 – 6.5	
May 9		FINAL EXAM Wed. May 11

Course Policies:

e-mail: *You are responsible for checking your* `alaska.edu` *e-mail account every day before class.* This is the e-mail address I have access to, and this is what I will use to get in touch with you. If you don't typically check it, then set it up to forward to your main account.

Absences and make-ups: You are expected to attend every class. Missing classes will have an adverse effect on your course grade. *If you miss more than six classes, or if you do not show up to take an exam, I may withdraw you from the course.*

If you must miss class, you are responsible for notifying me ahead of time to make appropriate arrangements. Except in unusual circumstances, make-up quizzes and exams will not be given.

Illness: Please do not come to class if you are possibly contagious. If you are too sick to come to class, please e-mail me **BEFORE CLASS**. Except under extreme circumstances, if you do not e-mail me before class I may not be able to arrange for make-up quizzes, etc.

Announcements: From time to time, announcements and comments will be sent out via e-mail. **It is your responsibility to check your e-mail account to receive this information.**

Evaluation:

Online Homework	10%
Quizzes, Written Homework, and other graded material	15%
Limit Proficiency Test	5%
Derivative Proficiency Test	5%
Exam 1	15%
Exam 2	15%
Exam 3	15%
Final exam	20%

To get a rough sense of how numerical grades correspond to letter grades, in general, 94% is the lower bound for an A and 55% is the lower bound for a D-, with linear interpolation in between, so that a numeric grade may be calculated by putting a percentage into the function $gr(x) = 23/6 + (5/57)(x - 93)$. This implies that the lower bound for an A- is 89.2%, the lower bound for a B- is 77.8%, etc. However, I reserve the right to change this scheme slightly depending on the particulars of the exam (e.g., how easy/hard it was). Also, your final grade will be calculated by summing all your numerical (not letter) grades, weighted as shown above. If you have any questions or concerns, come talk to me!

Support Services: You are strongly encouraged to attend office hours if you have questions, or e-mail/instant message me. I also encourage you to work with other students where appropriate. You may find the Math Lab (Chapman 305) to be helpful as well. Our teaching assistant also has hours in the Math Lab; check the posted schedules.

Disabilities Services: The Office of Disability Services implements the Amreicans with Disabilities Act (ADA) and insures that UAF students have equal access to the campus and course materials. I will work with the Office of Disability Services (203 WHIT, 474-7043) to provide reasonable accomodation to students with disabilities. Please come talk to me as soon as possible if you have/need accomodations.

MATH 201X: Calculus II SPRING 2011
Syllabus

Instructor: Gordon Williams
Contact Details: Chapman 303B, giwilliams@alaska.edu, 455-2756
Office Hours: MW 2:15-3, T 12:30-2, F 2:15-3:15, and by appointment. To make an appointment, just drop me an e-mail. You are also welcome to stop by my office at any time and see if I am free (even without a scheduled appointment); however, there is a possibility that I may be busy/away if you haven't set up an appointment. These office hours are subject to change.
Lecture Hours: MWF 1–2 PM DUCK 252, T 2–3 PM GRUE 206
Textbook: *Calculus II*, James Stewart (custom edition) ISBN 10: 0-495-45830-9 **OR** *Calculus*, James Stewart, 6th edition, early transcendentals
Course Web Page: `http://sites.google.com/a/alaska.edu/gordon-williams/home/201S2011`
Prerequisites: a grade of C or better in Math 200 Calculus I or its equivalent

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Course Overview and Goals:

The course description in the catalog reads as follows:

> Techniques and applications of integration. Integration of trigonometric functions, volumes including those using slicing, arc-length, integration by parts, trigonometric substitutions, partial fractions, hyperbolic functions, and improper integrals. Numeric integration including Simpson's rule, first order differential equations with applications to population dynamics and rates of decay, sequences, series, tests for convergence including comparison and alternating series tests, conditional convergence, power series, Taylor series, polar coordinates including tangent lines and areas, and conic sections.

Here's how I think of the course.
A. We continue where Calculus I left off...integration. We will learn several very sophisticated new methods of integration and we will see some new applications. You will be a good integration machine when we're done!
B. Next we will skip to Chapter 11 on Sequences and Series. This will be a completely new topic for most students and an incredibly interesting and surprising one. There are many ways this material relates to earlier ideas and here's one. Even after we're done with Chapter 8: Techniques of Integration, there will be many lovely, continuous, simple functions we still cannot integrate. The ideas in Chapter 11 will give us a powerful technique for attacking these.
C. We will end with a couple of new methods of representing curves: parametric curves and polar coordinates. In addition to enlarging our repertoire of curves, it is a foreshadowing of some crucial ideas in Calculus III.

Course Mechanics:

Class meetings will be run as an interactive lecture as much as is possible. I will always begin by asking if there are any questions – about homework or topics recently covered in class— and you

can help things go quickly by writing your questions on the board as we come in to class. Also, I will ask lots of questions of you and encourage you to participate. We will work problems in class too. Lectures will be supplemented with the occasional in-class worksheet or lab activity. You are expected to participate in the lecture by asking questions! I will call on people at random during class.

Attendance is expected and strongly encouraged, but not required. I will take roll regularly.

Online homework will be assigned multiple times each week using the online tool Web Assign. (See instructions on course web site for details.) These assignments will cover the essential practice exercises necessary to make progress in Calculus (approximately 10-15 routine problems per section). All deadlines are final. Your online homework average will be calculated as (points earned)/(points possible).

Textbook homework problems will be assigned regularly. These will be due on a weekly basis and will typically consist of two to three more challenging problems from each section. These problems are especially good practice for learning how to write up a solution to a problem, and a selection of these problems will be graded for both style and correctness (frequently, all of them). Late written homework will not be accepted.

Quizzes will be given intermittently as a check of basic skills. Quizzes will be announced in advance, typically take 20-30 minutes of class time, and grading will emphasize your ability to demonstrate clearly that your answer is the correct one. Make-up quizzes will only be given for excused absences at the instructors discretion. Calculators will not typically be allowed.

For quizzes and written homework the grade bands will be lowered by a letter grade: A (80-100%), B (70-80%), C (60-70%), D (50-60%), F (below 50%).

Exams will be written without the use of calculators. There will be two midterms and a comprehensive final exam. The midterms are tentatively scheduled for Monday February 21st and Monday April 4th. **The Final Exam will be Wednesday 11th May 1–3 PM.** It is DMS policy that final exams cannot be given early or late.

Make-up Midterms will be given only for excused absences. Except in extreme emergencies, absences *must* be approved in advance.

Grades will be calculated according to the following rubric:

Written homework / quiz average	10%
Online homework average	10%
Midterm 1	25%
Midterm 2	25%
Final Exam	30%

Grade Bands: A, A- (90 - 100%), B+,B, B- (80 - 89%), C+, C, C- (70 - 79%), D+, D, D- (60 - 69%), F (0 - 59%). I reserve the right to lower the thresholds. Also, in an effort to reward the student who makes significant improvement over the course of the term, a stellar grade on the final may overcome a deficiency on the midterm and improve a student's final grade.

(TENTATIVE) SCHEDULE OF TOPICS:

dates	topics		dates	topics
Week 1	intro, 7.1		Week 10	11.5, 11.6, 11.7
Week 2	7.1, 7.2		Week 11	11.7, 11.8, Review
Week 3	7.3, 7.4		Week 12	Midterm 2, 11.9, 11.10
Week 4	7.5, 7.7, 7.8		Week 13	11.10, 11.11, 10.1
Week 5	7.8, 8.1, 8.2, Review		Week 14	10.1, 10.2, Thanksgiving
Week 6	Midterm 1, 8.3, 11.1		Week 15	10.3, 10.4
Week 7	11.1, 11.2, 11.3		Week 16	10.5, 10.6, Review
Week 8	11.3, 11.4, 11.5		Week 17	Review, Final Exam

MISCELLANEOUS OTHER ISSUES:

Tutoring is available at no extra cost, on a walk-in basis, at the Math Lab in Chapman 305. Hours will be announced and posted on the door. A good way to use the Math Lab is to simply go there to do your homework, so that if any questions arise you can get immediate help.

Course accommodations: If you need course adaptations or accommodations because of a disability, please inform your instructor during the first week of the semester, after consulting with the Office of Disability Services, 203 Whitaker (474-7403).

University and Department Policies: Your work in this course is governed by the UAF Honor Code. The Department of Mathematics and Statistics has specific policies on incomplete grades, late withdrawals, and early final exams, some of which are listed below. A complete listing can be found at http://www.dms.uaf.edu/dms/Policies.html.

Late Withdrawal: This semester the last day for withdrawing with a W appearing on your transcript is Friday, March 25th. If, in my opinion, a student is not participating adequately in the class, I may elect to drop or withdraw this student. Inadequate participation includes but is not limited to: missing an exam, repeatedly failing to take quizzes or complete homework assignments, or having a failing average (below 70%) at the withdrawal date.

Academic Honesty: Academic honesty, including cheating and plagiarism, will not be tolerated. It is a violation of the Student Code of Conduct and will be punished according to UAF procedures.

Courtesies: As a courtesy to your instructor and fellow students, please arrive to class on time, turn your cell phones and iPods off during class, and pay attention in class.

MATH 202: Calculus III

MTWF 8:00 – 9:00
Gruening 208
http://www.dms.uaf.edu/~eallman/classes/202-fall-2009/202-2009.html

Instructor: Elizabeth S. Allman

Contact Details: Chapman 308B, e.allman@uaf.edu and 474-2479.

Office Hours: T 9-10, W 10:15-11:15, F 10:15-11:15, and by appointment.

Prerequisites: Calc II with a grade of C or better. No exceptions will be made.

Textbook: *Calculus* (early transcendentals), 5th ed., by J. Stewart, Brooks/Cole

Midterms: (tentative) W October 7, W November 18

Final Exam: Friday, December 18, 8:00 – 10:00 am

Course Overview and Goals:

Multivariable calculus is concerned with functions of many variables. Whereas in MATH 200 and MATH 201 you study functions of a single variable (height as a function of age $h(a)$, $f(x)$), in multivariable calculus functions will have more input variables (temperature of a particle in 3-space) or be vector-valued functions (position in 3-space $(x(t), y(t), z(t))$.

Our goal this semester is to extend your knowledge of calculus into the 2-, 3-, and $n-$dimensional realms. All of the techniques you learned from single variable calculus come into play here. Indeed, taking derivatives and computing integrals in the multivariate setting depends intimately on the ability to apply skills from univariate calculus.

Other interesting topics like vector fields and alternative coordinate systems appear. Multivariate calculus is essential for further study in physics, chemistry, engineering, economics, and many other fields, as well as in mathematics. Though visualization in three dimensions can be hard at first, the benefit is well-worth the effort.

Course Mechanics:

Class meetings will be run as interactive lectures, to the extent possible given the enrollment. That means that while I will be presenting material at the board, and you will be taking notes, I will also be asking for suggestions, ideas, and questions about the material as we go along. I don't expect 'correct' answers, but I do expect you to be actively following and participating (and taking notes) — that makes the class more interesting for us all.

Class attendance is expected, although I will not formally take roll. If you miss a class, you should get notes from another student. Homework assignments will be posted on the course web page either right before class or soon after class is over. You should bookmark the homework web page, as this is where you will find assignments, due dates, and updates.

Quizzes will be given randomly throughout the semester, roughly once per week. These will typically take 10-15 minutes and be similar to recent homework. These serve two primary purposes 1) to encourage you to be present in every class and 2) to ensure that you stay current with the homework. If you expect to miss a class, you should talk to me in advance about having any potential quiz waived — you must have a good reason and (except in situations I consider to be emergencies) you cannot get retroactive approval.

Homework will usually be assigned daily, and collected each Wednesday. I will typically begin each class by asking if there are questions about the last lecture and its homework

assignment. That means you should review notes and make at least an initial attempt on homework problems before the next class meeting, even though problems may not be collected until several days later. While it never hurts to ask, in general I will defer questions about any earlier assignment to my office hours, in order to keep the course moving along.

I encourage you to work with others on the homework, but you must *write up solutions independently*. You will learn nothing from simply copying someone's solution. Even though you may find you can't do every problem, you must make a reasonable attempt on them all. The entire homework assignment will be checked to be sure you have attempted everything. Selected problems may be graded more completely, if a grader is assigned to this course.

Homework will be accepted until 5pm on its due date, either at my office or in my mailbox in the math department office. I will not accept *any* late homework that has not been cleared ahead of time or is not due to a genuine emergency (e.g., a death in the family).

Missed examinations that are not approved in advance will result in an 'F' on that exam. No make-up exams will be given except in extreme circumstances (e.g., family death, documented illness, etc.). Notifying me by email or a note that you will miss an exam is not sufficient for advance approval; you must speak with me to be excused.

Tutoring is available at no cost, on a walk-in basis, at the Math Lab in Chapman 305. Hours will be announced, and posted on the door. A good way to use the Math Lab is to simply go there to do your homework, so that if any questions come up you can get immediate help.

Calculators will not be allowed on any examinations or quizzes. This will ensure that testing conditions are equal for everyone. I have no strong feelings on whether you use a calculator when doing homework. As long as you are sure you have the skills to do all calculations by hand, it is fine for you to use technology as a time saver.

Auditing of this course will only be allowed for those who agree to attend regularly, as evidenced by completion of midterm exams and most quizzes.

Grades:

There will be two midterm exams and a cumulative final exam in MATH 202. In addition, there will be weekly homework assignments and regular (announced and unannounced) quizzes. Grades will be assigned using the following weights:

Homework	10 %
Quizzes	15 %
Midterm 1	20 %
Midterm 2	25 %
Final Exam	30 %

Grade Bands: A, A- (90 - 100%); B+, B, B- (80 - 89%); C+, C, C- (70 - 79%); D+, D, D- (60 - F%); 69 (0 - 59%). On rare occasion, I may lower the thresholds. Also, in an effort to reward the student who makes significant improvement over the course of the term, a stellar grade on the final may overcome a deficiency on the midterm and improve a student's final grade.

University and Department Policies:

Course accommodations: If you need course adaptations or accommodations because of a disability, please inform your instructor during the first week of the semester, after consulting with the Office of Disability Services, 203 Whitaker (474-7403).

Detailed Policies: Your work in this course is governed by the UAF Honor Code. The Department of Mathematics and Statistics has specific policies on incompletes, late withdrawals, and early final exams, some of which are listed below. A complete listing can be found at

`http://www.dms.uaf.edu/dms/Policies.html`.

Prerequisites: The prerequisite for MATH 202 is MATH 201 with a grade of C or better. Students not meeting this prerequisite are not eligible to take this course and will be dropped.

Late Withdrawal: This semester the last day for withdrawing with a 'W' appearing on your transcript is October 30.

Graded Coursework: Please keep all graded work for MATH 202 until final grades have been assigned.

Academic Honesty: Academic dishonesty, including cheating and plagiarism, will not be tolerated. It is a violation of the Student Code of Conduct and will be punished according to UAF procedures.

Courtesies: As a courtesy to your instructor and fellow students, please arrive to class on time and turn your cell phones and iPods off during class.

Math 302 Differential Equations Spring 2011

3 Credits

Class time: **Tue, Thu 9:45 - 11:15, GRUE 205**

Instructor: Dr. Alexei Rybkin, CHAP 304B, 474-6002, e-mail: arybkin@alaska.edu

Office Hours: MWF 10:30 - 11:30, and by appointment; CHAP 304B

Prerequisites: MATH 200-202 with a C or better.

Text: Differential Equations by G. Zill, classic fifth edition.

Course Description:

Galileo Galilei once said 'Mother Nature speaks the language of differential equations'. It was said three hundred years ago and it becomes even truer nowadays. This course is a foundation for many physics and engineering courses. It will also put your calculus together. The main goal of this course is to equip you with active knowledge of basic methods for solving ordinary differential equations. This course shall cover parts of Chapter 1. (Introduction to Differential Equations), 2. (First-Order Differential Equations), 3. (Applications of First-Order Differential Equations), 4. (Linear Differential Equations of Higher Order), 5. (Applications of Second-Order Differential Equations: Vibrational Models), 6. (Differential Equations with Variable Coefficients) if time permits, 7. (Laplace Transform)

Homework and Quizzes:

Homework (hw) will be assigned every class period and due **Thursday in the beginning of the class period**. Specific requirements on hw submission will be given later if need arises. Expect also to have **quizzes** announced one day in advance. One quiz will weight as one hw assignment. Exact number of quizzes is not set up yet. Absolutely **no late hw** will be accepted and **no make-ups** for quizzes will be offered. However about **15%** of lowest grades will be dropped. Hw and quizzes will be graded by the TA. Only a sample of hw problems will be graded. I will grade the tests.

Midterms:

There will be **three** one-hour **closed book midterms** (announced at least one week in advance). No graphing calculator is allowed. An hour review will be given one

class prior to each midterm discussing the exam in great detail. No make-ups except for documented circumstances.

Final Exam:

A two hour closed book comprehensive exam is on **Tue, May 10, 3:15 -5:15.** Please do not plan on leaving prior to the final exam as it is against the departmental policy to give earlier final exams (see http://www.dms.uaf.edu/dms/Policies.html)

Attendance: Will not be taken. If you are late or miss class you should get notes/important info from **a fellow student**.

Support Service: Math Lab in Chap 305 is available for free with tutors on duty.

Grades: Are determined from:

- Hw and Quizzes **20%**
- Three Midterms **50%**
- Final **30%**

Course grades are determined as follows (in interval notation):

A+	**(97,100]**	**B+**	**(87, 90)**	**C+**	**(77, 80)**
A	**(93, 97]**	**B**	**(83, 87]**	**C**	**(73, 77]**
A-	**[90, 93]**	**B-**	**[80, 83]**	**C-**	**[70, 73]**
D+	**(67, 70)**	**F**	**[0, 60)**		
D	**(63, 67]**				
D-	**[60, 63]**				

I reserve the right to adjust this scale if particular exams turn out to be unexpectedly difficult. This however happens very rarely and you should not rely on this. Borderline cases will be graded up or down based upon your overall performance (including attendance and class room participation).

Withdrawals:

The deadline for withdrawal is **March, 25.** I reserve the right to withdraw you from class if you are subject to one of:

- fail to submit **two** or more consecutive hw assignments
- maintain an average of **55%** or less on quizzes and tests by the withdrawal deadline
- don't have all **prerequisites** for this class

University and Department Policies: Your work in this course is governed by the UAF Honor Code. Visit http://www.dms.uaf.edu/dms/Policies.html for the Depart of Math and Statistics specific policies on incompletes, late withdrawals, and early final exams.

Disabilities Services: The Office of Disability Services implements the Americans with Disabilities Act (ADA). Please contact the Office of Disabilities Services (203 WHIT, 474-7043) to set up any necessary accommodations.

Have a great semester and best of luck!!!

ES 208 – Mechanics

1. 4 credits, Lecture: MWF 1:00pm – 2:00pm; Lab: R: 2:00pm – 5:00pm

2. Instructor: Gang Chen (MIN)

3. Textbook: Hibbeler, R. C. "Engineering Mechanics - Statics and Dynamics", 12th Edition, Prentice Hall, New Jersey.

4. Specific course information
   1. The course will cover both statics and dynamics. Discussion will include composition and resolution of forces and force systems, principles of equilibrium applied to various bodies, simple structures, friction, centroids and moments of inertia. The course will also cover motion of particles, kinematics and kinetics of plane motion of rigid bodies, and principles of work and energy.
   2. Prerequisite: ES F100 or GE F101 or MIN F103 and MATH F201X; PHYS F211X.
   3. Required course
   4. Grading:
      Homework.....35%
      Quizzes.....15%
      Midterm Exam 1 .....15%
      Midterm Exam 2 .....15%
      Final Exam.....20%

5. Specific goals for the course
   1. Through the course of the study, students should have a good understanding of the fundamental theories of statics and dynamics as applicable to engineering problems. The students should learn to use mathematic tools to solve mechanics problems and have good understanding of these mechanics problems in engineering applications.
   2. This course helps students meet student outcomes:
      (a) an ability to apply knowledge of mathematics, science, and engineering
      (e) an ability to identify, formulate and solve engineering problems

6. Brief list of topics to be covered
   1. Introduction
   2. Forces and Vectors
   3. Force System
   4. Distributed Loading
   5. Equilibrium
   6. Plane Trusses
   7. Frames and Machines
   8 Internal Forces
   9. Friction
   10. Centroids of Lines, Areas and Volumes
   11. Moments of Inertia
   12. Kinematics of a Particle

13. Force and Acceleration of a Particle
14. Work and Energy of a Particle
15. Impulse and Momentum of a Particle
16. Rigid Body Kinematics
17. Force and Acceleration of Rigid Body
18. Work and Energy of Rigid Body
19. Impulse and Momentum of Rigid Body

1) **ES 307 – Elements of Electrical Engineering**

2) 3 Credits. Lecture: TR 8:00 – 9:30 am.

3) Instructor: H. Ed Bargar

4) "Essentials of Electrical and Computer Engineering" by David V. Kerns, Jr. & J. David Irwin
   a) Class Web site located at: http://medept.engr.uaf.edu

5) Specific course information.
   a) Catalog description: Elementary circuits and theorems; nodal and mesh analysis; transient analysis; ac steady state and power analysis, power compensation; basic electronics; electromechanical systems: magnetic circuits, DC/AC machines and transformers.
   b) Prerequisite: MATH 202X.
   c) Required course.

6) Specific goals for the course.
   a) Electrical Engineering concepts and principles are presented directed primarily to engineering students in other engineering disciplines. Electricity is commonly used to transport energy from one location to another. Electrical machinery is used to transform energy. Electrical circuits are used to control equipment and govern its operation. An understanding of the principles of electrical circuits and electrical machinery is important to all fields of engineering since electrical equipment will be encountered in every field of modern engineering practice. Upon completion of this course, the student shall be familiar with: basic circuit laws including Ohm's Law and Kirchhoff's Law; analyses of AC & DC circuits to determine voltage, current, impedance, and power characteristics. Included is single-phase and three-phase circuit/power analysis; the design and operation of rotating equipment such as generators and motors; control circuits and solid state logic.
   b) This course helps students meet outcomes:
      (a) An ability to apply knowledge of mathematics, science, and engineering.
      (c) An ability to design a system, component, or process to meet desired needs.
      (e) An ability to identify, formulate, and solve engineering problems.
      (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

7) Brief list of topics covered:
   a) DC steady-state circuit analysis and basic laws.
   b) DC transient circuit analysis.
   c) AC steady-state circuit analysis.
   d) AC power analysis.
   e) Magnetic coupling and transformers.
   f) Basic diode and rectifier circuits.
   g) DC generators and motors.
   h) AC generators and motors.
   i) Synchronous machines.
   j) Control circuits and ladder diagrams.

1. **ES 331 - Mechanics of Materials**

2. 3 credits, Lecture: MWF 1:00pm – 2:00pm

3. Instructor: Yongtao Dong (CEE)

4. *Mechanics of Materials*, 5th Ed., F. Beer, E. Johnston, and J. Dewolf, McGraw Hill, ISBN 978-0-07-722140-9
    a. Other handouts will be provided.

5. Specific course information
    a. Catalog description: Analysis of internal forces in members subjected to axial, torsional, and flexural loads, or load combinations. Stress-strain relationships and material property definitions; shear and moment diagrams, Mohr's Circle. Applications include beams, columns, connections, indeterminate cases.
    b. Prerequisite: ES F208 (Mechanics) or ES F209 (Statics) and MATH F201X (Calculus II).
    c. Required course

6. Specific goals for the course
    a. The goals of this course include:
        (a) to develop ability to analyze a given problem in a simple and logical manner;
        (b) to apply a few fundamental and well-understood principles to problem solving;
        (c) to learn analytical techniques for stress and strain under different types of loading;
        (d) to understand how to perform stress/strain transformation and to find the principal stress/strain,
        (e) to develop capability of calculating beam deflection and learn how to draw bending and shearing diagrams to complement the calculation; and
        (f) to introduce students to the concepts of structural stability.
    b. This course helps students meet student outcomes:
        (a) an ability to apply knowledge of mathematics, science, and engineering
        (e) an ability to identify, formulate, and solve engineering problems
        (g) an ability to communicate effectively
        (i) a recognition of the need for, and an ability to engage in life-long learning
        (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

7. Brief list of topics to be covered
    Chapter 1. Introduction
        1.1 Concept of stresses – normal stress
        1.2 Shearing stress and bearing stress
        1.3 Stress on an oblique plane, stress components
    Chapter 2. Stress and strain- axial loading
        2.1 Normal strain, stress-strain relation, Hooke's Law

2.2 Elastic vs. plastic behavior, fatigue
2.3 deformation under axial loading
2.4 Indeterminate problems, Thermal stress
2.5 Poisson's Ratio, generalized Hooke's Law
2.6 Shearing strain, relation among E, ν and G,
2.7 Saint-Venant's Principle, stress concentration, plastic deformation

Chapter 3. Torsion
3.1 Stress and deformation of shaft under torsion
3.2 Indeterminate shaft
3.3 Noncircular, thin-walled hollow shafts

Chapter 4. Pure Bending
4.1 Pure bending, stress
4.2 Deformation
4.3 Composite members, stress concentrations
4.4 Eccentric loading in a plane of symmetry
4.5 General eccentric loading

Chapter 5. Beams for Bending
5.1 Shear and bending moment diagrams
5.2 Relations among load, shear and moment
5.3 Design of beam for bending

Chapter 6. Shearing Stresses in Beams
6.1 Shearing stress in beams
6.2 Longitudinal shear
6.3 Shearing in thin-walled members

Chapter 7. Transformation of Plane Stress
7.1 Transformation of plane stress
7.2 Principal stresses, max. shearing stress
7.3 Mohr's Circle for plane stress
7.4 Mohr's Circle, examples
7.5 Stress in thin-walled pressure vessels

Chapter 9. Deflection of Beams
9.1 Deformation of beams
9.2 Statically indeterminate beams
9.3 Method of superposition

Chapter 10. Columns
10.1 Stability of columns
10.2 Columns with different end conditions
10.3 Design of columns

Chapter 11. Energy Methods
11.1 Strain energy & strain-energy density
11.2 Elastic strain energy for different stresses
11.3 Impact loading
11.4 Work-energy method and its application

3. ES 341 – Fluid Mechanics

4. 4 credits, Lecture: MWF 10:30am – 11:30am; Lab: M,T,W, R: 2:15pm – 5:15pm

4. Instructor: Dennis Filler

5. Crowe, C. T., Elger, D. F. and Roberson, J.A. 9th Edition. Engineering Fluid Mechanics. John Wiley & Sons, Inc.

6. Specific course information
    a. Catalog description: Statics and dynamics of fluids; energy and momentum principles. Dimensional analysis; flow in open channels, closed conduits and around submerged bodies. Special fees apply.
    b. Prerequisites: MATH F201X (Calc II) and ES F208 (Mechanics) or ES F210 (Dynamics).
    c. Required course

7. Specific goals for the course
    a. 1) Understand basic properties of fluids (extensive, intensive properties).
       2) Understand basic concepts of fluid dynamics (velocity, acceleration, control-volume approach).
       3) Develop the ability to solve problems involving momentum, energy, and similitude principles (continuity, Bernoulli, momentum, Froude, Reynolds, Darcy-Weisbach, etc.).
    b. This course helps students meet student outcomes:
       (a) an ability to apply knowledge of mathematics, science, and engineering
       (b) an ability to design and conduct experiments, as well as to analyze and interpret data
       (d) an ability to function on multi-disciplinary teams
       (e) an ability to identify, formulate, and solve engineering problems
       (g) an ability to communicate effectively
       (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

8. Brief list of topics to be covered
    a. Fluid properties
    b. Fluid statics
    c. Flowing fluids
    d. Control volume and continuity
    e. Momentum and energy
    f. Dimensional analysis and similitude
    g. Surface resistance
    h. Flow in conduits
    i. Drag
    j. Flow measurements
    k. Open channel flow

1) **ES 346 – Basic Thermodynamics**
2) 3 credits, Lecture: TR 9:45 – 11:15 am.
3) Instructor: H. Ed Bargar.
4) "Thermodynamics – An Engineering Approach, 7th Edition"* by Yunus A. Cengel & Michael A. Boles
   a) *The 6th edition may be used in place of the 7th edition.
   b) Class Web site located at: http://medept.engr.uaf.edu.
5) Specific course information
   a) Catalog Description: Thermodynamic systems, properties, processes, and cycles. Fundamental principles of thermodynamics (first and second laws) and elementary applications.
   b) Prerequisites: MATH 201X, PHYS 211X.
   c) Required course.
6) Specific Goals for the course:
   a) Basic principles of thermodynamics are covered. These include: properties of pure substances; heat, work, and other forms of energy and energy transfer; and the 1st & 2nd Laws of Thermodynamics. The student will learn: basic engineering problem solving techniques; the concepts of processes, cycles, control volumes, and system boundaries; how to utilize conservation of mass, conservation of energy, and material properties to analyze thermodynamic systems; an understanding of energy efficiency based on the analyses of heat engines and heat, work, & energy systems.
   b) This course helps students meet outcomes:
      a An ability to apply knowledge of mathematics, science, and engineering.
      e An ability to identify, formulate, and solve engineering problems.
      g An ability to communicate effectively.
      k The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
      h An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
7) Brief list of topics covered.
   a) Units and dimensional analysis.
   b) Systems, control volumes and states.
   c) Types of energy.
   d) The 1st Law of Thermodynamics and its relation to energy and energy transfer.
   e) Properties of substances. Property tables and equations of state.
   f) 1st Law analyses of closed systems.
   g) 1st Law analyses of open systems.
   h) The 2nd Law of Thermodynamics.
   i) Sources and sinks.
   j) Reversible and irreversible process and the Carnot Cycle.
   k) Entropy.

1. **GE261 – GENERAL GEOLOGY FOR ENGINEERS**
2. 3.0 credits, Lecture: Monday, Wednesday 9:15-10:15 am; Labs Wednesday, Friday 2:15-5:25 pm, Thursday 2:00-5:10 pm
3. Instructor: Dr. Margaret Darrow
4. Kehew, A. E. (2006). *Geology for Engineers and Environmental Scientists*: Prentice Hall, Upper Saddle River, New Jersey.
5. Specific course information:
   a) 2010-2011 Catalog Description: Study of common rocks and minerals, landforms and erosion. Geologic materials and engineering application of geology.
   b) Prerequisites: MATH107, MATH108 or equivalent; Geology, science, or engineering majors, or permission of the instructor
   c) Required course
6. Specific goals for the course
   a) 1) To understand the fundamental principles of geology and geologic processes; 2) To understand the basic engineering properties of soil and rock; 3) To identify major geohazards and possible mitigation techniques in both an Alaskan context and a global context; 4) To develop the ability to function on multi-disciplinary teams.
   b) This course helps students meet outcomes:
      (d) an ability to function on multi-disciplinary teams;

      (h) an ability to understand the impact of engineering solutions in a global context

7. Brief list of topics to be covered:
   Plate Tectonics
   Minerals
   Igneous Rocks
   Sedimentary Rocks
   Metamorphic Rocks
   Geologic Time
   Structural Geology
   Rock Mechanics
   Earthquakes
   Soil Mechanics
   Mass Movement
   Rivers
   Groundwater
   Glaciers
   Permafrost

Appendix B – Faculty Vitae

Sukumar Bandopadhyay

Academic Rank:
Professor of Mining Engineering

Education:
Ph.D (Mining Engineering), Pennsylvania State University, 1982
M.S.(Mining Engineering and Operations Research), Pennsylvania State University, 1979
M.Tech (Mine Planning), Banaras Hindu University, 1975
B.Sc (Mining Engineering), Banaras Hindu University, 1970

Years of Service at UAF:
Professor of Mining Engineering (1992-todate), Tenured
Associate Professor Mining Engineering (1987-1992) Tenured
Assistant Professor of Mining Engineering (1982-1987).

Other Related Experience:
Instructor of Mining Engineering (1975-76), Banaras Hindu University, India
Underground Manager, National Coal Development Corporation, Sudamdih Project, 1973-1975
Mining Engineer, Manganese Ore (I) Ltd., Balaghat Mine, 1970-72.
Graduate Research and Teaching Assistant, College of Earth and Mineral Sciences, Pennsylvania State University, 1976-82.

Professional Registration:
Registered Professional Mining Engineer (Alaska), Registration #AA8696

Selected Publications of Last Five Years:

Purushotham, T, and S. Bandopadhyay, "Analyzing Shock Losses at Air-Crossings in a Mine Ventilation Network Using CFD Simulations", Proceedings of the 13th US/North American Mine Ventilation Symposium, Hardcastle S and McKinnon (Eds.), PP. 463-468, 2010

Purushotham, T and S. Bandopadhyay, "Estimation of Shock Loss Coefficient Values of Mine Ventilation Configurations Using CFD Simulations" Proceedings of the 9th. International Mine Ventilation Congress, D. C. Panigrahi (ed.), Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, Vol. 2, PP. 619-629, 2009.

Dutta, Sridhar, Sukumar Bandopadhyay, R. Ganguli, and D, Misra, "Machine Learning Algorithms and Their Application to Ore Reserve Estimation of Sparse and Imprecise Data," Journal of Intelligent Learning Systems and Applications (JILSA), DOI10:4326/jilsa.2010.22012, Vol. 2, No. 2, PP. 86-96, 2010.

Samanta, Biswajit and Sukumar Bandopadhyay, "Conditional Simulation of a Placer Gold Deposit Using Sequential Gaussian, Histogram-Matching, and Simulated Annealing Algorithms", Transactions, SME, Vol.326, PP. 111-119, 2010.

Samanta, Biswajit and Sukumar Bandopadhyay, " Construction of a RBF Network Using an Evolutionary Algorithm for Ore body Modeling in a Placer Gold Deposit" Computer and Geoscience, V. 35, No 8, PP. 1592 August, 2009.

Chatterjee, Snehamoy, Bandopadhyay, Sukumar, and David Mory-Machuka ,
" Ore Grade Prediction using Genetic Algorithm and Clustering Based Ensemble Neural Network Model",Mathematical Geosciences, 2009**.**

Chatterjee, Snehamoy , Sukumar Bandopadhyay and David Mory--Machuca,
" Ore Waste Classification of a Lead Zinc Deposit Using Support Vector Machine, SME Transactions**,** Vol.324, PP. 94-103, 2009

Chatterjee, Snehamoy, Sukumar Bandopadhyay, and Piyush Rai,
"A Genetic Algorithm Based Neural Network Learning Parameter Selection Approach for Ore Grade Evaluation of a Limestone Deposit", Mining Technology (TIMM A),IMM, London, Vol.117, # 4, PP. 178-190, 2008.

Scientific and Professional Society Membership:
Sigma Xi
Society for Mining, Metallurgy and Exploration, Inc., SME/AIME
Institute for Operations Research and Management Science INFORMS)

Honors and Awards (Last Five Years):
Howard N. Eavenson Award (2010) for distinguished contributions to the advancement of coal mining, advancement of the coal industry by research, invention, publication or advances in mining and development methods, SME
Ivan B. Rahn Education Award (2007), Society for Mining, metallurgy and Exploration, Inc.
Certificate of Appreciation for Dedicated Service as Golden North Region Vice President (2006-07) of the Society for Mining, Metallurgy and Exploration, Inc., By 2007 SME President, Jim Arnold

Institutional and Professional Service in the Last Five Years:

Member, Accreditation & Curricular Issue Committee, SME, 2006-09
Member –at –Large, Professional Engineers Exam committee, 2006-08
Member, APCOM Council, SME, 2006-11
Chair, International APCOM Council, 2007-2011
Alaska Miners Association Representative Member: POGO Mine Compliance Group, 2005-
Chair, University-wide Post-tenure Review Committee, 2008-09
Member, University-wide Post-tenure Review Committee, 2008-10
Member, University-wide Promotion & Tenure Committee, 2006-2008

Professional Development Activities in the last Five Years:
Lieca GPS RTK System Training, Fall 2010.
Leica Geosystems: Advance GPS Course, May 2006
Leica Geosystems: GPS RTK Course, May 2006
Leica Geosystem: GPS Basic Course, April 2006
MAPTEK: Introduction to Underground Design, January 2006
MAPTEK: Introduction to Block Modeling, January, 2006
MAPTEK: Vulcan Basics, January 2006

CURRICULUM VITAE
GANG CHEN, Ph.D., P.E.

EDUCATION

Ph.D. Mining Engineering, 1989, Virginia Polytechnic Institute & State University.
M.S. Mining Engineering, 1984, Colorado School of Mines.
B.S. Mining Engineering, 1977, Shandong Mining Institute (Currently Shandong U of Sci & Tech).

PROFESSIONAL REGISTRATION

P. E., Mining Engineering, Registered in Alaska and Virginia

PROFESSIONAL EXPERIENCE

Professor (July 2002 to present)
Dept. of Mining & Geological Eng., University of Alaska Fairbanks
Dept. Chair (July 2005 to June 2009)
Dept. of Mining & Geological Eng., University of Alaska Fairbanks
Associate Professor (July 1997 to June 2002)
Dept. of Mining & Geological Eng., University of Alaska Fairbanks
Assistant Professor (August 1993 to June 1997)
Dept. of Mining & Geological Eng., University of Alaska Fairbanks
Researcher and Instructor (January 1991 to August 1993)
Virginia Polytechnic Institute & State University
Research Associate (February 1989 to January 1991)
Department of Mining Engineering, Southern Illinois University at Carbondale.
Research Assistant (April 1985 to February 1989)
Department of Mining & Minerals Engineering, Virginia Polytechnic Institute & State University
Instructor (September 1977 to May 1982)
Department of Geology and Mining Engineering, Fuzhou University.

SELECTED PUBLICATIONS

1. Zhou, W., G. Chen, H. Li, H. Luo and S. L. Huang, "GIS Application in Mineral Resource Analysis – A Case Study of Offshore Marine Placer Gold at Nome, Alaska", Computers and Geosciences, Vol. 33, 2007, pg. 773-788.
2. Li, H., H. Luo, G. Chen, W. Zhou and S. Huang, "Visualized Geostatistical Analysis of Nome Offshore Gold Placer Deposit Using ArcGIS - A Case Study", Transactions of Society of Mining Engineers, Vol. 318, 2005.
3. Sun, C. and G. Chen, "Cluster Analysis of Skarn Distribution Using Fuzzy Relation", World Journal of Engineering, Vol. 1, No. 3, 2005.
4. Chen, G., et al, Editors, Proceedings, 40th U.S. Rock Mechanics Symposium, 2005.
5. Chen, G., H. Li, "Analysis of Block Removability in Rock Excavation by Probabilistic Approach", Proceedings of the 1st Canada-US Rock Mechanics Symposium, Vancouver, Canada, May 27-31, 2007.
6. Li, H. and G. Chen, "Study of Anisotropy of Rock Elastic Properties of Fairbanks Schist Utilizing Ultrasonic Waves", Proceedings, 4th Asian Rock Mechanics Symposium, Paper A0501, 2006.
7. Luo, H., W. Zhou, S. Huang and G. Chen, "Sesimic Response Analysis And Earthquake-Induced Slope Failure– A Case Study of Las Colinas Landslide, El Salvador", Proceedings, 4th Asian Rock Mechanics Symposium, Paper A0473, 2006.
8. Li, H., T. Zhang, G. Chen and L. Jing, "Laboratory Experiments and Computer Simulation of Ultrasonic Wave Propagation in Fractured and Inhomogeneous Rock", Proceedings, 40th U.S. Rock Mechanics Symposium, 2005.
9. Chen, G., "Probabilistic Key Block Analysis of a Mine Ventilation Shaft Stability – A Case Study", Invited manuscript under review for Geomechanics & Geoengineering, 2010.
10. Li, H. and G. Chen, "Sonic Wave Propagation in Freezing Sand and Soil", Manuscript in

preparation to be submitted to the Journal of Cold Region Engineering (ASCE), 2010.

11. Li, H. and G. Chen, "Laboratory and Numerical Modeling Studies of Dynamic Freezing Process of Soil Based on Computerized Ultrasonic Tomography", Manuscript in preparation to be submitted to the Journal of Cold Region Engineering (ASCE), 2010.

PROFESSIONAL AFFILIATIONS

1. Member of the Society of Mining, Metallurgy and Exploration
2. Member of the Alaska Miners Association
3. Member of the International Society for Rock Mechanics
4. Member of the American Rock Mechanics Association
5. Member of the International Society of Explosives Engineers

AWARDS

1. Affiliated Chair Professor of Fuzhou University (China), 2008
2. Outstanding Professor of the Year, UAF SME, 1995, 1997, 1998, 1999, 2001, 2002, 2003.
3. Honorary Professor of Hebei University of Engineering (China), 2003
4. Underground Mining Unit Chair Award, Society of Mining, Metallurgy and Exploration, 1999.

RECENT SERVICE ACTIVITIES

Technical Paper Review for SME Transactions, Mining Engineering, Int. J. of Rock Mechanics, Geomech & Geoeng and others	4 to 5 per year	Reviewer
Mining Engineering ABET Review Preparation	2002 – 2006	Coordinator
CEM Executive Committee	2004 - 2009	Member
SME/CEM Promotion and Tenure Committee	2003 – 2008	Member
President Professor Search Committee	2004 – 2007	Member
Mining Faculty Search Committee	2009 – 2010	Chair
Dept. of Mining & Geological Eng.	2005-present	Dept. Chair
AEG 2011 Meeting Organizing	2009 – present	Tech Section Developer
40th US Rock Mechanics Symposium	2004 -2005	Org. Committee Chair
SME M&E Scholarship Committee	2006 – present	Member

RECENT PROVESSIONAL DEVELOPMENT

1. Workshop on Laser Scanning & Photogrammetry Methods for Rock Engineering, 2006
2. VULCAN (Computer- aided Mine Design Software) Training, 2006, 2007
3. Digital Photogrammetry Technique for Rock Engineering Training, 2007
4. GPS RTK Surveying Training, 2010
5. Attended SME Annual Meeting for the last 5 years
6. Attended Several National and International Rock Mech Symposium in the last 5 years

Rajive Ganguli

Education

PhD (Mining Engineering), University of Kentucky, 1999
MS(Mining Engineering), Virginia Polytech Inst. & State Univ, 1995
BE(Mining Engineering), Osmania University, India, 1991

Academic experience

University of Alaska Fairbanks, Chair, Dept of Mining & Geological Engg, 2009-now
University of Alaska Fairbanks, Professor of Mining Engg, 2009-now
University of Alaska Fairbanks, Associate Professor of Mining Engg, 2006-2009
University of Alaska Fairbanks, Associate Professor of Mining Engg, 2003-2005
University of Alaska Fairbanks, Assistant Professor of Mining Engg, 1999-2004

Non-academic experience

Jim Walter Resources, Mine Foreman and Mine Engineer, 2005-2006
Hindustan Copper Limited, India, Mine Engineer, 1991-1993

Certifications or professional registrations

Professional Engineer (Alaska) – Mining Engineering
Mine Foreman (Alabama)
Certified Online Instructor (Walden Institute)

Current membership in professional organizations

Society of Mining, Metallurgy and Exploration, Inc (SME).
Alaska Miners Association
American Association of University Professors

Major Honors and awards

Flame Safety Lamp award, State of Alabama, 2005
Robert Peele Memorial Award, SME, 2004
Carol Feist Advisor Award, University of Alaska Fairbanks, 2003

<u>Major</u> Service activities (within and outside of the institution)

Department Chair, Mining and Geological Engineering
Faculty Senator, University of Alaska Fairbanks
Associate Editor, Mining Engineering, SME Publication
Director, Alaska Miners Association
Golden Valley Electric Association, Member Advisory Committee

Major Publications (last 5 years)

Ganguli, R., Dagdelen, K. and Grygiel, E., 2011, Peer Reviewed Chapter on "Systems Engineering" in SME Mining Engineering Handbook (2011 Edition), SME Publishers, In Print.

Ganguli, R., Beer, S.R. and Watson, M., 2011, Peer Reviewed Chapter on "Monitoring, Control and Communications" in SME Mining Engineering Handbook (2011 Edition), SME Publishers, In Print.

Agarwal, S. and Ganguli, R., 2011, "Automating modeling of operational data to identify the most important factors" SME Annual Meeting.

Samanta, B., Dutta, S., Bandopadhyay, S. and Ganguli, R., 2010, "Comparative Performance of Radial Basis Function Network and Support Vector Regression in an Automated Spatial Mapping of Natural Radioactivity," International Journal of Environmental Pollution Control and Management, 1(2) July-December 2009, pp 111-131.

Dutta, S., Bandopadhyay, S., Ganguli, R. and Misra, D., 2010, "Machine Learning Algorithms and Their Application to Ore Reserve Estimation of Sparse and Imprecise Data", Journal of Intelligent Learning Systems and Applications, Vol 2., No. 2, pp.86—96.

Ganguli, R. and Bandopadhyay, S., 2008, "Field Scale Investigation of Pulverized Coal Mill Power Consumption," Minerals and Metallurgical Processing, SME Publication, Vol. 25, No. 3, pp 139-142.

Malav, D., Ganguli, R., Dutta, S. and Bandopadhyay, S., 2008 "Non-impact of Particle Size Distribution on Power Generation at a Pulverized Coal Power Plant Burning Low Rank Alaska Coal," Journal of Fuel Processing Technology, Vol 89, No. 5, 499-502.

Professional development activities (last 3 years)

SME Annual Meeting, Denver, Feb-March, 2011
Alaska Miners Association Conference, Anchorage, November, 2010
Arctic Mining Conference, Kotzebue, Alaska, April 2010
SME Annual Meeting, Phoenix, Arizona, March 2010
2 day short course on mining industry data mining, Univ of Arizona, March 2010
Alaska Miners Association Conference, Fairbanks, March 2010
Alaska Miners Association Conference, Anchorage, November, 2009
APCOM, Vancouver, Canada, 2009
Vulcan Mine Design Training (5 day), 2009
Alaska Miners Association Conference, Anchorage, November, 2008
MinExpo, Las Vegas, 2008
Arctic Science Symposium, Fairbanks, 2008
Ethics in Research (1/2 day workshop), UAF, 2008
Mass Min, Lulea, Sweden, 2008

Hsing K. Lin, Ph.D.
Professor of Hydrometallurgy

Mineral Industry Research Laboratory (907)474-6347
University of Alaska Fairbanks hklin@alaska.edu
Fairbanks, AK 99775-7240

EDUCATION

Institution	Date	Degree	Major
National Cheng Kung University, Taiwan	1970-1974	B.S.	Mining Engineering
National Cheng Kung University, Taiwan	1976-1978	M.S.	Mining Engineering
University of Alaska Fairbanks	1978-1980	M.S.	Mineral Preparation Eng.
University of Utah	1980-1985	Ph.D.	Metallurgy

ACADEMIC EXPERIENCE

1996-Present Professor of Hydrometallurgy, Mineral Industry Research Laboratory, University of Alaska Fairbanks
2009-2010 Visiting Professor, College of Chemical and Environmental Engineering, China University of Mining and Technology (Beijing)
2009-2009 Visiting Professor, Department of Resource Engineering, National Cheng Kung University
1992-1996 Associate Professor, Mineral Industry Research Laboratory, University of Alaska Fairbanks
1988-1992 Assistant Professor, Mineral Industry Research Laboratory, University of Alaska Fairbanks
1987-1988 Visiting Assistant Professor, Mineral Industry Research Laboratory, University of Alaska Fairbanks
1986-1987 Post Doctoral Research Assistant, Mineral Industry Research Laboratory, University of Alaska Fairbanks
1986-1986 Post Doctoral Research Assistant, Department of Metallurgy and Metallurgical Engineering, University of Utah

PRINCIPAL PUBLICATIONS (selected 5 refereed journal papers in last 5 years)

Lin, H.K., "Electrochemical behavior of tennantite in chloride solutions," Journal of Electrochemical Society, 153, no.(7), pp. J74-J79, 2006.

Lin, H.K., Walsh, D.E., Oleson, J.L. and Chen, X., "Reduction of cyanate to cyanide in cyanidation tailings under reducing environments," Minerals and Metallurgical Processing, 25, no.(1), pp. 41-45, 2008.

Lin, H.K., Walsh, D.E., Sønderland, S.H., Bissue, C. and Debrah, A., "The flotability of metallic iron fines from comminution circuits and their effect on flotation of a sulfide ore," Minerals and Metallurgical Processing, 25, no.(4), pp. 206-210, 2008.

Lin, H.K., Walsh, D.E., Chen, X. and Oleson, J.L., "Release of heavy metals from sulfide flotation tailings under deepwater discharge environments," Minerals and Metallurgical Processing, 26, no.(3), pp. 174-178, 2009.

Lin, H. K., Oleson, J.L. and Walsh, D. E., "The behavior of gold and silver in various processing circuits at the Fort Knox Mine," Minerals and Metallurgical Processing, 27, no. (4), pp. 219-223, 2010.

PROFESSIONAL SOCIETY

Member, SME, American Institute of Mining, Metallurgical and Petroleum Engineers
Member, TMS, American Institute of Mining, Metallurgical and Petroleum Engineers
Member, Selenium-Tellurium Development Association

NATIONAL/INTERNATIONAL AWARDS

Arthur F. Taggart Award, 2003, Society for Mining, Metallurgy and Exploration, Inc. (SME) for the paper:

Lin, H.K., Hill E.M., and Oleson, J.L., "Recovering gold from carbon fines by gold transfer process," Minerals and Metallurgical Processing, 20, no.(1), pp. 47-51, 2003.

Arthur F. Taggart Award, 2007, Society for Mining, Metallurgy and Exploration, Inc. (SME) for the paper:

Hollow, J.T., Hill, E.M., Lin, H.K. and Walsh, D.E., "Modeling the influence of slurry temperature on cyanidation plant efficiencies at the Fort Knox Mine, Fairbanks, Alaska," Minerals and Metallurgical Processing, 23, no.(3), pp. 151-159, 2006.

(Details of the Award can be found in SME Website
http://www.smenet.org/awards/viewAward.cfm?category=6&typeId=32)

INSTITUTIONAL AND PROFESSIONAL SERVICES (last 5 years)

University-wide 4th year Comprehensive Review Committee, 2006-2008.
Editorial board member, Journal of Minerals & Materials Characterization &Engineering, 2004-present
Committee Member, Hydrometallurgy and Electrometallurgy Committee, TMS-AIME, 2008-present
Committee Member, Metallurgical Processing Committee, SME-AIME, 1999-present
Non-paid professional consultation to communities, 1986-present

PERCENTAGE OF WORKLOAD FOR RESEARCH: 41%
PERCENTAGE OF TIME COMMITTED TO MIN PROGRAM: 0%

Sabry Sabour

Education

PhD (Mineral Economics), Kyoto University, Japan & Assiut University, Egypt, 2000
M.Sc (Mining Engineering), Assiut University, Egypt, 1996
B.Sc (Mining Engineering), Assiut University, Egypt, 1991

Academic experience

University of Alaska Fairbanks, Assistant Professor of Mining Engg, 2010-now
McGill University, Canada, Research Associate, 2009-2010
McGill University, Canada, Adjunct Professor, 2008-2009
McGill University, Canada, Research Associate, 2006-2007
Laval University, Canada, Postdoctoral Fellow, 2004-2006
Kyoto University, Japan, Visiting Researcher, 1998-2000
Assiut University, Egypt, Various teaching positions, 1991-2004

Non-academic experience

Amec Americas Ltd, Canada, Senior Financial Analyst, 2008-2009

Certifications or professional registrations

Professional Engineer (P.Eng.) APEGBC, British Columbia, Canada

Major Publications (last 5 years)

Abdel Sabour, S.A., and Poulin, R., 2010. Mine expansion decisions under uncertainty. International Journal of Mining, Reclamation and Environment, Volume 24, Issue 4, pp. 340 – 349.

Abdel Sabour, S.A., and Dimitrakopoulos, R., 2010. Mine design under geologic and market uncertainties. In The 4th International Conference on Mining Innovation, Castro, R. et al (ed), June 23-25, 2010 Santiago, Chile, pp. 183-194

Abdel Sabour, S.A., and Wood, G., 2009. Modeling financial risk in open pit mine projects: Implications for strategic decision-making. Journal of the Southern African Institute of Mining and Metallurgy (SAIMM), Volume 109, Number 3, pp. 169-175.

Abdel Sabour, S.A., and Dimitrakopoulos, R., 2008. Mine plan selection under uncertainty. Mining Technology: IMM Transactions Section A, Volume 117, Number 2, pp. 53-64.

Abdel Sabour, S.A., and Dimitrakopoulos, R., 2009. Accounting for joint ore supply and market demand uncertainties in mine design. In Orebody Modelling and Strategic Mine Planning 2009 Conference, Dimitrakopoulos, R. (ed), 16 – 17 March 2009, Perth, Western Australia, pp. 21-26.

Abdel Sabour, S.A., and Dimitrakopoulos, R., 2009. A multi-criteria decision support system for open pit mine planning under geological and market uncertainties. In 2009 SME Annual Meeting, Feb. 22-25, 2009 Denver, Co, Preprint 09- 008.

Meagher, C., Abdel Sabour, S.A., and Dimitrakopoulos, R., 2009. Pushback design of open pit mines under geological and market uncertainties. In Orebody Modelling

and Strategic Mine Planning 2009 Conference, Dimitrakopoulos, R. (ed), 16 – 17 March 2009, Perth, Western Australia, pp. 297-304.

Abdel Sabour, S.A., and Dimitrakopoulos, R., 2008. Accounting for geological and market uncertainties in open pit mine planning. In Strategic vs Tactical Approaches in Mining, Hadjigeorgiou, J. (ed), Laval University, Quebec City, September 28- October 01, 2008, pp. 136-145.

Lemelin, B., Abdel Sabour, S.A., and Poulin, R., 2007. A flexible mine production model based on stochastic price simulations: application at Raglan mine, Canada. Mining Technology: IMM Transactions Section A, Volume 116, Number 4, pp. 158- 166.

Dimitrakopoulos, R., and Abdel Sabour, S.A., 2007. Evaluating mine plans under uncertainty: can the real options make a difference? Resources Policy, Volume 32, Number 3, pp. 116-125.

Abdel Sabour, S.A., 2007. Valuing the operating flexibility of mineral processing plants. CIM Magazine, Volume 2, Number 9, February 2007, 8 p.

Lemelin, B., Abdel Sabour, S.A., and Poulin, R., 2007. An integrated evaluation system for mine planning under uncertainty. In Proceedings of the 33rd International Symposium on Application of Computers and Operations Research in the Mineral Industry (APCOM 2007), April 24-27, 2007, Santiago, Chile, pp. 261-269.

Allard, S., Poulin, R., Abdel Sabour, S.A., and Samis, M., 2007. Considering foreign exchange rate risk in mine project evaluations. In Proceedings of the 33rd International Symposium on Application of Computers and Operations Research in the Mineral Industry (APCOM 2007), April 24-27, 2007, Santiago, Chile, pp. 687-695.

Abdel Sabour, S.A., and Poulin, R., 2006. Valuing real capital investments using the least-squares Monte Carlo method. The Engineering Economist, Volume 51, Number 2, pp. 141-160.

Lemelin, B., Abdel Sabour, S.A., and Poulin, R., 2006. Valuing Mine 2 at Raglan using real options. International Journal of Mining, Reclamation and Environment, Volume 20, Number 1, pp. 46-56.

Professional development activities

SME meeting, Denver, Colorado, 2011
MININ2010, Santiago, Chile, 2010
MPES Conference, Banff, Alberta, Canada, 2009
Strategic Mine Planning Conference, Perth, Western Australia, 2009
MineSight for Long Term Planning, professional development short course, Feb. 2-6, 2009, Amec Americas Ltd, Vancouver, Canada
Strategic vs Tactical Approaches in Mining, Laval University, Quebec City, Canada, 2008
Xeras Software Training Course, industry workshop, June 18-19, 2008, Amec Americas Ltd, Vancouver, Canada
Strategic Risk Management and Applied Optimization in Mine Design, professional development short course, May 23-25, 2007, McGill University, Montreal, Canada
CAMI/MPES Conference, Banff, Alberta, Canada, 2005

NAME: Daniel E. Walsh

Academic Rank: Professor
Degrees: B.S. Mining Engineering, University of Alaska Fairbanks, 1981
M.S. Mineral Preparation Engineering, University of Alaska Fairbanks, 1985

Number of years of service on this faculty: 27
Date of appointment: September 1984
Date of advancement in rank: 1999 (Professor)
Related Experience:
July 1999 to present: Professor of Mineral Preparation Engineering, MIRL
July 2008 to August 2009: Sabbatical Leave; CSIRO, Australia
July 2001 to August 2002: Sabbatical Leave (Australia and S. Africa and New Zealand)
September 1995 to June 1999: Associate Professor of Mineral Preparation Engineering, MIRL
July 1994 to September 1995: Associate Professor of Mining Extension, MIRL
November 1990 to 1994: Assistant Professor of Mining Extension, MIRL
September 1984 to November 1990: Instructor of Mineral Preparation Engineering, MIRL

Consulting:
Member, Board of Advisors, Mineral Ventures, LLC, Reno, NV.
Consulting work Barrick Gold, 2008.
Non-paid consulting to mineral industry as part of MIRL's mission (numerous)

Professional Registration: Mining Engineer, Alaska, 1986 (EM 7114), has continuing ed. requirement.
Member, AK Board of Registration for Architects, Engineers and Land Surveyors, 2006-present
Member, NCEES Finance Committee

PATENTS

1. Lin, H.K. and Walsh, D.E., "Method for producing gold nanoparticles," U.S. Patent, 2006.
2. Walsh, D.E. and JKTech, "CGS Cyclone," Provisional Patents, 2002-2004, Australia.

PUBLICATIONS OF LAST FIVE YEARS:
A: Peer-reviewed Journal Articles

1. Oleson, J. L., Lin, H. K., and Walsh, D.E., "Modeling of SO2/air Cyanide Destruction Process", Minerals and Metallurgical Processing, 2005.
2. Hollow, J.M., Hill, E.M., Lin, H.K. and Walsh, D.E., 2006, "Modeling the Influence of Slurry Temperature on Gold Leach and Adsorption Kinetics at the Fort Knox Mine, Alaska" *Minerals and Metallurgical Processing*, Vol. 23, No. 3, August.
3. Hollow, J.M., Lin, H.K., Walsh, D.E. and White, D.M., 2007, "The Development of an Energy Balance Model to Predict the Economic Impact of Installing a Tailings Wash Thickener at the Fort Knox Mine, Alaska" *Minerals and Metallurgical Processing* Vol. 24, No. 2, May.

4. Lin, H.K., Walsh, D.E., Sonderland, S.H., Bissue, C. and Debrah, A., 2008, "Flotabiltiy of Metallic Iron Fines from Comminution Circuits and Their Effect on Flotation of a Sulfide Ore," *Minerals and Metallurgical Processing* Vol. 25, No. 4, November.
5. Lin, H.K., Walsh, D.E., Oleson, J.L. and Chen, X., 2008, "Reduction of Cyanate to Cyanide in Cyanidation Tailings under Reducing Environments," *Minerals and Metallurgical Processing* Vol. 25, No. 1, February.
6. Lin, H.K., Walsh, D.E., Oleson, J.L. and Chen, X., 2009, "Release of Heavy Metals from Sulfide Flotation Tailings under Deepwater Discharge Environments," *Minerals and Metallurgical Processing* Vol. 26, No. 3, August.

B: Conference Proceedings and Research Reports: (21 citations, examples shown)

1. Willson, W.G., Walsh, D.E., Riggs, J. and Korpi, D., 2009, "Low Rank Coal-Water Fuel, a Cleaner Way to Use Coal," presented at Mongolia's Coal Conference (in conjunction with the 50th Anniversary of The Mongolian Mining Institute), Ulaanbaatar, Mongolia, July.
2. Bissue, C., Walsh, D.E. and Lin, H.K., 2008, "Froth Flotation Characterization and Processing Plant Design for the Platiniferous and Auriferous Marine Sediments of Southwestern Alaska," Poster Session at the 21st Biennial Interior Alaska Mining Conference, Fairbanks, Alaska, March.
3. Walsh, D.E., 2009, "Development of Laboratory Hardware and a Protocol for Direct Determination of Breakage Functions for Fine Particles in Ball Mills," DMR-3626, CSIRO Minerals, Queensland Center for Advanced Technologies, Brisbane, Australia.
4. Walsh, D.E. and Lin, H.K., 2009, "Optimization of Low-Rank Coal-Water Fuel Production Parameters for Mississippi Lignite Feedstock," Research Project Annual Progress Report for Silverado Gold Mines Ltd, Vancouver, B.C., Canada.
5. Walsh, D.E. and Willson, W.G., 2008, "Utilization of Subbituminous 'C' Coal from the Beluga Coal Field; Opportunities and Challenges," proprietary report prepared for Barrick Gold Corporation, Toronto, Canada.
6. Walsh, D.E. and Wies, R., 2006, "Design Criteria for a Double Roll Coal Crusher at the Aurora Energy Power Plant," final report prepared for Usibelli Coal Mine, Inc. and Aurora Energy, Inc., November, 8 pp.

Professional Memberships: SME, Tau Beta Pi, AAUP.
Institutional and Professional Services: Many (details available upon request)
Professional Development activities: Conferences & (other examples shown below)
Member, AK Board of Registration for Architects, Engineers and Land Surveyors, 2006-present
Member, NCEES Finance Committee (national appointment)
"Grinding & Classification Models for Making Plant Improvements," 2006 SME Short Course, St. Louis, Missouri.

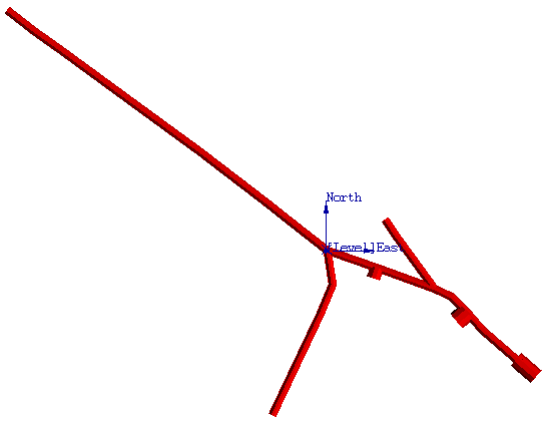
Appendix C – Equipment

Please list the major pieces of equipment used by the program in support of instruction. Mining engineering students use laboratories that belong to the mining engineering program or geological engineering program. Additionally, they use the Delta Mine Training Center, on a as-needed basis.

I. Mining Engineering Laboratories

Silver Fox Mine (SFM)

The department owns the Silver Fox mine, where students get hands on training. SFM is a small hard rock silver mine, with about 700 ft of total underground workings. It was recently re-opened after its portal collapsed a few years ago. UAF did not have the funding to do the rehab work for many years. Local mining vendors and mines have donated materials to rehab the mine. The mine has a small fan (4000 cfm), ventilation tubes, a generator, a compressor, tracks, bobcat (for mucking), small pump, a jackleg and a new leaky-feeder communication system. Immediate needs include roof bolts, wire mesh, larger fan and vent tube. We hope to be able to blast for the first time in over a decade in Fall 2011.



Coal Preparation Laboratory

The laboratory capabilities include the following: coal analysis, coal petrology, vitrinite reflectance as a measure of rank, washability analysis (heavy liquid separation), crushing circuits, sizing equipment, (tables, jigs, spirals, and water-only cyclones), froth flotation, dewatering circuits, and hydrothermal treatment. The major pieces of equipment include Fisher Coal Analyzer 490 for proximate analyses, Leitz Vario-Othomat microscope, crushers, pulverizers, screens, hardgrove grindability mill, Coal hydrothermal treatment facility, concentrating tables, batch flotation cells, classifying cyclone, jigs, spirals, water-only cyclones. Recent upgrade includes the acquisition of TGA from U.S. DOE.

Mineral Preparation Engineering Laboratory

Laboratory capabilities include: Crushing, grinding, sizing classification, wet gravity concentration, froth flotation, magnetic and electrostatic separation, chemical analysis of ores, concentrates and tailings, flow rate measurements, pulp density measurements and heavy liquid separations. The major pieces of Equipment include jaw crusher, roll crusher, cone crusher, pulverizer, ring grinder, ball mills, Ro-tap sieve shaker, bond grindability mill, sieves, vibrating screens, static screens, jigs, spiral, hydrocyclones, tables, flotation cells (Denver), magnetic separators, electrostatic separators, Franz magnetic separator and atomic absorption (Perkin Elmer). Recent upgrade since 2001 includes the acquisitions of an electronic balance, the SWECO screen and the Tyler Sieves.

Rock Mechanics Laboratory

The Rock Mechanics laboratory is used for conducting experiments and tests on rock and soil samples under various environmental conditions, for both teaching and research purposes. The major piece of equipment in the laboratory is a rock testing machine with a loading capacity of 330,000 lbs. The testing machine includes an environmental chamber and a fully computerized control and data acquisition system. Other equipment in the laboratory include a tensile strength testing machine with a loading capacity of 55,000 lbs, a direct shear testing apparatus, and several field testing and monitoring instruments. The digital control and data acquisition system was recently upgraded in the fall of 2001. In addition, a creep testing frame with a capacity of 100,000 lbs and an Ultrasonic Pulse Velocity (UPV) testing system were added to the laboratory in 2001 and 2004 respectively.

Rock Drilling and Rock Core Preparation Laboratory

The laboratory is equipped with a rock coring machine, a rock saw and a grinding machine. The laboratory is primarily used to prepare specimens for testing and experiments to be conducted in the Rock Mechanics Laboratory. In addition, the rock coring machine has been instrumented allowing precise measurement of several drilling parameters for detailed drilling experiments. The grinding machine and the rock saw were overhauled in 2002 and 2005.

Computer Laboratory

The computer lab, a network of 10 desktop computers acquired in 2010 and a printer, is a multipurpose lab used by all students of the department (Mining and Geological Engineering). There are software packages available for word processing, drawing, scanning, and the internet. The lab is also used by students for classes that require the use of software packages specific to certain areas such as VULCAN, ArcGIS, AutoCAD, ERDAS Imaging, ERMapper, and MATLAB.

Mine Design Laboratory

The mine design lab, a network of 5 desktop computers with very large monitors, is dedicated for Mining Engineering students that wish to use specific mine design software for their mine design project during their senior year. It is also used to teach courses such as MIN 481 and 482 that require use of design software. The major software includes VULCAN, TECHBASE, COSTMINE, MATLAB, NEUROSHELL2 and ISATIS.

Mine Ventilation Laboratory

The Mine Ventilation Laboratory has the most advanced instruments for the measurements of atmospheric environmental conditions (gas, dust, heat and humidity velocity and pressure of air) in mines. The unique feature of the laboratory is a mine model (as two mine airways in parallel). Two fans are of centrifugal type and blow air into the airways. The fans can be operated in parallel. A "CONSPEC Senturion 500 Mine Ventilation monitoring and control system" which is an integral part of the ventilation laboratory has been installed for remote and continuous monitoring of mine environment. In 2001, a ventilation educator system was purchased and added to the lab.

Mine Surveying Laboratory

The laboratory contains the most up-to-date surveying equipment for surface and underground mine surveying. This laboratory provides convenient first-hand exposure to mine surveying for students enrolled in mining and geological engineering programs. The major pieces of equipment include total stations, digital theodolites, transits, EDMs and GPS systems. Recent additions include two total stations (2010) and a GPS base station.

II. Geological Engineering Laboratories Available to Mining Engineering Students

A number of other laboratories in the Department of Mining and Geological Engineering are also available to Mining Engineering students who take related courses or conducting class related projects. These include:

General Geology for Engineers Laboratory

The laboratory consists of materials for mineral and rock identification, topographic and geologic map reading, and airphoto interpretation. In addition to rock and mineral identification and map reading, students are expected to be able to recognized the landforms associated with each of the major geologic processes. The laboratory exercises emphasize landforms in Alaska, and field trips supplement the classroom experience. The laboratory contains common mineral collections, various rock collections, stereoscopes various maps and air photos.

Geotechnical Laboratory

The Geotechnical Lab is used to teach geological engineering students basic soils engineering including the effects of groundwater on soils. Laboratory equipment available to perform testing includes specific gravity, moisture content, sieve analysis, hydrometer analysis, Atterberg limits, standard and modified Proctor compaction, and falling and constant head permeability. Field equipment for soil sampling is also available.

Subsurface Hydrology Laboratory

The Subsurface Hydrology Lab is used by undergraduate students for the groundwater hydrology class. Tests for particle size analysis, soil properties, and hydrological parameters can be conducted. A field instrument for measuring the groundwater level is available.

Exploration Geophysics Laboratory

The space designated for the laboratory is only storage space for the field equipment. The laboratory functions are in part completed in the field, depending on weather conditions. The majority of laboratory work is conducted in the lecture classroom. The laboratory exercises entail review of the operating procedures for the equipment and reduction of data collected in the field or actual field data collected in previous years. Laboratory problem sets are available for each geophysical exploration method listed in the course description. The major pieces of equipment include Refraction seismograph, VLF, Gravity meter (on loan from the Geophysical Institute), Horizontal/vertical Loop EM, Magnetometers, Max-min EM, Resistivity meter and Gamma ray spectrometer.

Appendix D – Institutional Summary

Programs are requested to provide the following information.

1. The Institution

a. Name and address of the institution

University of Alaska Fairbanks
PO Box 757500
Fairbanks, Alaska 99775-7500
www.uaf.edu

b. Name and title of the chief executive officer of the institution

Pat Gamble, UA System President
Brian Rogers, UAF Chancellor

c. Name and title of the person submitting the self-study report.

Rajive Ganguli, Professor
Department of Mining and Geological Engineering

d. Name the organizations by which the institution is now accredited and the dates of the initial and most recent accreditation evaluations.

The university has been accredited by the Northwest Commission on Colleges and Universities since 1934. The most recent full-scale accreditation evaluation was in 2001. This was followed in 2006 by a five-year interim report. The next NWCCU accreditation self-study will be submitted in fall 2011.

2. Type of Control

Description of the type of managerial control of the institution, e.g., private-non-profit, private-other, denominational, state, federal, public-other, etc.

State and Federal.

3. Educational Unit

Describe the educational unit in which the program is located including the administrative chain of responsibility from the individual responsible for the program to the chief executive officer of the institution. Include names and titles. An organization chart may be included.

The College of Engineering and Mines (CEM) is organized into six departments:

a. Civil and Environmental Engineering
b. Computer Science
c. Electrical and Computer Engineering
d. Mechanical Engineering
e. Mining and Geological Engineering
f. Petroleum Engineering,

and offers the following programs

- Arctic Engineering M.S.
- Civil Engineering B.S., M.C.E., M.S.
- Computer Engineering B.S.
- Computer Science B.S., M.S.
- Construction Management graduate certificate
- Electrical Engineering B.S., M.E.E., M.S.
- Engineering Ph.D.
- Engineering Management M.S.
- Environmental Quality Engineering M.S.
- Environmental Quality Science M.S.
- Geological Engineering B.S., M.S.
- Mechanical Engineering B.S., B.S/M.S., M.S.
- Mineral Preparation Engineering M.S.
- Mining Engineering B.S., M.S.
- Petroleum Engineering, B.S., M.S.
- Science Management M.S.

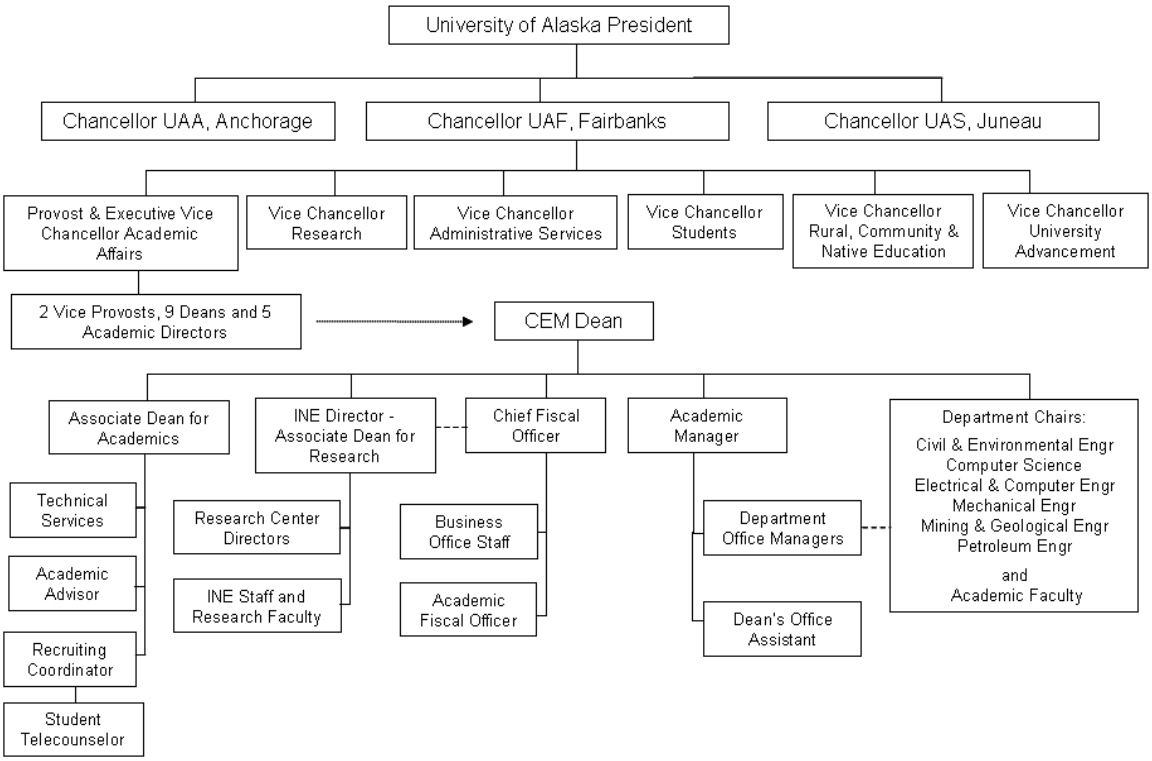
The FY 10 enrollment in the college was 672 undergraduate students and 146 graduate students, and there were 101 degrees awarded. Grant-funded research expenditures in INE (Institute of Northern Engineering) totaled $14,306,000 in FY 10, with total research expenditures of $18,184,000.

The Computer Science department joined CEM in FY11, and with the addition of their 7 faculty, CEM/INE currently has 59 faculty, including 6 that are research only, and 46.5 staff members.

The college organization chart is below. The top level administration from the chart is:
CEM Dean – Douglas Goering
Associate Dean for Instruction – Charlie Mayer
INE Director – Associate Dean for Research – Daniel White
Chief Fiscal Officer – Nickole Conley
Academic Manager – Linda Ilgenfritz
Civil and Environmental Engineering Department Chair – David Barnes
Computer Science Department Chair – Kara Nance
Electrical and Computer Engineering Department Chair – Charlie Mayer
Mechanical Engineering Department Chair – Jonah Lee
Mining and Geological Engineering Department Chair – Rajive Ganguli
Petroleum Engineering Department Chair – Catherine Hanks

The CEM Dean reports to the UAF Provost, Susan Henrichs, who reports to the UAF Chancellor, Brian Rogers, who reports to the UA President, Pat Gamble.

College of Engineering and Mines within the University of Alaska
Organizational Chart



4. Academic Support Units

List the names and titles of the individuals responsible for each of the units that teach courses required by the program being evaluated, e.g., mathematics, physics, etc.
Chemistry, John Keller, Chemistry and Biochemistry Department Chair
Math, John Rhodes, Mathematics and Statistics Department Chair
Physics, John Olson, Physics Department Chair
College of Liberal Arts (CLA), Burns Cooper, Interim Dean College of Liberal Arts. CLA offers the general education requirement courses.

5. Non-academic Support Units

List the names and titles of the individuals responsible for each of the units that provide non-academic support to the program being evaluated, e.g., library, computing facilities, placement, tutoring, etc.

Libraries [http://www.uaf.edu/uaf/academics/libraries], Responible Individual: Paul McCarthy, Interim Dean of Libraries.

UAF computing facilities are operated by OIT (Office of Information Technology); [www.uaf.edu/oit], Responsible Individual: Steve Smith , Chief Information Technology Officer.

UAF Academic Advising Center provides placement testing and advising; [www.uaf.edu/advising], Responsible Individual: Linda Hapsmith, Director.

Tutoring is provided within the academic units. The Department of Mathematical Sciences (DMS) provides daily tutoring in the Math Lab, located in the Chapman Building [http://www.dms.uaf.edu/dms/MathLab/MathLabIntro.html], Responsible Individual: Latrice Laughlin, Instructor, Department of Mathematics and Statistics. The Engineering Tutoring Lab is located in the Duckering Building and is manned 6 days a week by engineering student tutors, Responsible Individual: Charlie Mayer, Associate Dean for Instruction, CEM.

6. Credit Unit

It is assumed that one semester or quarter credit normally represents one class hour or three laboratory hours per week. One academic year normally represents at least 28 weeks of classes, exclusive of final examinations. If other standards are used for this program, the differences should be indicated.

The standard definition of credit hour applies at UAF: 1 credit hour represents 1 hour of class per week (or three laboratory hours per week) for 14 weeks per semester.

7. Tables

Complete the following tables for the program undergoing evaluation.

Table D-1. Program Enrollment and Degree Data

Mining Engineering

	Academic Year		Enrollment Year					Total Undergrad	Total Grad	Degrees Awarded			
			1st	2nd	3rd	4th	5th			Associates	Bachelors	Masters	Doctorates
Current Year	AY10-11	FT	6	7	5	7		25	6	0	3	1	1
		PT	3	0	0	5		8	2				
1	AY09-10	FT	7	5	7	4		23	6	0	3	0	0
		PT	0	0	1	2		3	2				
2	AY08-09	FT	6	4	5	7		22	2	0	2	3	0
		PT	1	1	1	1		4	5				
3	AY07-08	FT	5	4	2	8		19	5	0	1	2	0
		PT	1	1	1	1		4	3				
4	AY06-07	FT	2	4	4	5		15	8	0	2	1	3
		PT	0	0	1	1		2	3				

Give official fall term enrollment figures (head count) for the current and preceding four academic years and undergraduate and graduate degrees conferred during each of those years. The "current" year means the academic year preceding the fall visit.

FT--full time
PT--part time

UAF Institutional Research tracks enrollment past the 4th year as being in the senior year; hence there is no separate data for 5th and succeeding years.

Table D-2. Personnel

Mining Engineering

Year[1]: 2010-2011

	HEAD COUNT		FTE[2]
	FT	PT	
Administrative[3]	1		0.1
Faculty (tenure-track)	4		4
Other Faculty (excluding student Assistants)	2		0.2
Student Teaching Assistants	1		1
Student Research Assistants	2		
Technicians/Specialists			
Office/Clerical Employees	1		0.5
Others[4]			

Report data for the program being evaluated.

[1] Data on this table should be for the fall term immediately preceding the visit. Updated tables for the fall term when the ABET team is visiting are to be prepared and presented to the team when they arrive.

[2] For student teaching assistants, 1 FTE equals 20 hours per week of work (or service). For undergraduate and graduate students, 1 FTE equals 15 semester credit-hours (or 24 quarter credit-hours) per term of institutional course work, meaning all courses — science, humanities and social sciences, etc. For faculty members, 1 FTE equals what your institution defines as a full-time load.

[3] Persons holding joint administrative/faculty positions or other combined assignments should be allocated to each category according to the fraction of the appointment assigned to that category.

[4] Specify any other category considered appropriate, or leave blank.

Appendix E – Alumni/Employer Survey

Appendix E1 – Alumni Survey 2010

Population Sampled: Graduates of 2005 to 2009 (5 years)
Total Population: 10
Responses: 8 ➔ Response Rate: 80%

1. Indicate your current area of employment. Add the year of graduation in the box at the end. Create Chart Download

	Response Percent	Response Count
Coal mine	25.0%	2

1. "Program Educational Objectives" are broad statements that set the direction of the program. Therefore, they are very important. We would like to know if our current Program Educational Objectives are appropriate. Create Chart Download

	Appropriate	Not Appropriate	Response Count
To graduate competent engineers who are prepared for employment in the mineral and energy industries in temperate and arctic regions	100.0% (8)	0.0% (0)	8
To graduate competent engineers who are prepared to solve problems germane to Alaska, and	100.0% (8)	0.0% (0)	8
To graduate competent engineers who are professional and understand the need to stay technically current	100.0% (8)	0.0% (0)	8
		I suggest the following	0
		answered question	8
		skipped question	0

1.	2007	Wed, Jun 30, 2010 2:19 PM	Find...
2.	2009	Tue, Jun 22, 2010 11:16 AM	Find...
3.	2009	Mon, Jun 21, 2010 10:30 PM	Find...
4.	2006	Fri, Jun 18, 2010 1:46 PM	Find...
5.	2006	Fri, Jun 18, 2010 10:09 AM	Find...
6.	2005	Thu, Jun 17, 2010 6:39 PM	Find...
7.	2006	Mon, Jun 14, 2010 12:53 PM	Find...

answered question	8
skipped question	0

2. We would like to know if we met our current Program Educational Objectives with you.

Create Chart Download

	You met the objectives with me	You did not meet the objectives with me	Response Count
To graduate competent engineers who are prepared for employment in the mineral and energy industries in temperate and arctic regions	**100.0% (8)**	0.0% (0)	8
To graduate competent engineers who are prepared to solve problems germane to Alaska, and	**100.0% (8)**	0.0% (0)	8
To graduate competent engineers who are professional and understand the need to stay technically current	**100.0% (8)**	0.0% (0)	8
		Comments	0
		answered question	**8**
		skipped question	**0**

3. "Program Outcomes" are narrower statements than Program Educational Objectives and describe what students are expected to know and be able to do by the time of graduation. We would like to know how much of each of the outcomes you achieved. Rate them 1-5, 1 for not achieved and 5 for strongly achieved.

Create Chart Download

	1	2	3	4	5	Rating Average	Response Count
An ability to apply knowledge of mathematics, science, and engineering	0.0% (0)	0.0% (0)	0.0% (0)	37.5% (3)	**62.5% (5)**	4.63	8
An ability to design and conduct experiments, as well as to analyze and interpret data	0.0% (0)	0.0% (0)	0.0% (0)	37.5% (3)	**62.5% (5)**	4.63	8
An ability to design a system, component, or process to meet desired needs	0.0% (0)	0.0% (0)	25.0% (2)	**37.5% (3)**	**37.5% (3)**	4.13	8
An ability to function on multi-disciplinary teams	0.0% (0)	0.0% (0)	12.5% (1)	37.5% (3)	**50.0% (4)**	4.38	8
An ability to identify, formulate, and solve engineering problems	0.0% (0)	0.0% (0)	12.5% (1)	25.0% (2)	**62.5% (5)**	4.50	8
An understanding of professional and ethical responsibility	0.0% (0)	0.0% (0)	25.0% (2)	**50.0% (4)**	25.0% (2)	4.00	8
Ability to communicate effectively	0.0% (0)	0.0% (0)	25.0% (2)	25.0% (2)	**50.0% (4)**	4.25	8
The broad education necessary to understand the impact of engineering solutions in a global and societal context	0.0% (0)	0.0% (0)	25.0% (2)	25.0% (2)	**50.0% (4)**	4.25	8
A recognition of the need for, and ability to engage in life-long learning	0.0% (0)	0.0% (0)	25.0% (2)	12.5% (1)	**62.5% (5)**	4.38	8
A knowledge of contemporary issues	0.0% (0)	0.0% (0)	0.0% (0)	**62.5% (5)**	37.5% (3)	4.38	8
An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	0.0% (0)	0.0% (0)	12.5% (1)	**50.0% (4)**	37.5% (3)	4.25	8
A knowledge of unique engineering and environmental issues in the arctic and subarctic regions.	0.0% (0)	0.0% (0)	12.5% (1)	25.0% (2)	**62.5% (5)**	4.50	8
						answered question	8
						skipped question	0

1. What professional certifications do you have? Example include blaster's certificate, foreman's certificate, EIT etc. In each case, please provide additional details

Create Chart | Download

	Response Percent	Response Count
EIT (specify year & discipline in the box below)	71.4%	5
PE (specify year & discipline in the box below)	14.3%	1
Other#1 (specify name of certification & date in the box below)	14.3%	1
Other#2 (specify name of certification & date in the box below)	0.0%	0
Hide replies Other Details of Certification		6

1.	2009 Mining Engineer	Tue, Jun 22, 2010 11:19 AM	Find...
2.	EIT, general, fall 2009 Coal Blaster's License	Mon, Jun 21, 2010 10:37 PM	Find...
3.	eit in 2006 general engineering	Fri, Jun 18, 2010 1:51 PM	Find...
4.	WAQTC Certified in Asphalt, Concrete, Aggregate, Embankment & Base, and In-Place Density Certified Radiation Safety Officer	Fri, Jun 18, 2010 10:38 AM	Find...
5.	2010, Mining Engineering	Thu, Jun 17, 2010 6:44 PM	Find...
6.	EIT: General Engineering, 2005	Mon, Jun 14, 2010 12:59 PM	Find...

answered question	7
skipped question	1

2. Have you undergone any training/short course, such as on a product or software or regulation, in the last 7 years since graduating? If yes, please provide the name and year of training/short course. Download

	Response Count
Hide replies	6

1.	Efficient Blasting Techniques - 2009	Tue, Jun 22, 2010 11:19 AM	Find...
2.	SurvCADD training, fall 2009	Mon, Jun 21, 2010 10:37 PM	Find...
3.	2 courses in mine ventilation software in 2006 and 2007 from mine ventilation services as well as vulcan training in 2007	Fri, Jun 18, 2010 1:51 PM	Find...
4.	Supervisor Training 2009 Traffic Control Technician 2008 FHWA Contract Administration 2008 FEMA Emergengy Management 2006 Rock Slope and Foundation Anchoring/Reinforement 2008 Defensive Driving Course 2009 Several of the UAF Conctruction Administration Masters Certificate classes in 2008 and 2009	Fri, Jun 18, 2010 10:38 AM	Find...
5.	I'd have to look back through my certifications... Blasting, Mine Planning Software, slope stability software	Thu, Jun 17, 2010 6:44 PM	Find...
6.	Mintec MineSight for Short/Mid-Range Planning 2007, AutoCad Civil 3D 2007 & 2008 Modular Dispatch System 2009, 2010 Microsoft Excel 2009 Linux 2009 Microsoft Access 2010 ArcGIS 2010	Mon, Jun 14, 2010 12:59 PM	Find...

answered question	**6**
skipped question	**2**

3. How often do you go to job-related conferences Create Chart Download

	Response Percent	Response Count
About once a year	50.0%	4
About once every couple years	25.0%	2
About once every five years	0.0%	0
Never been to one since I graduated	25.0%	2
	answered question	8
	skipped question	0

4. Are you currently working in the mining industry related profession? Create Chart Download

	Response Percent	Response Count
Yes	62.5%	5
No	37.5%	3
	answered question	8
	skipped question	0

Note that these are the TOP ranked areas from the 7 respondents

Note that these are the second ranked areas from the 7 respondents etc

1. List up to five (in priority of the most significant) technical skills or areas of academic training that are necessary for the performance of your job: Download

	Response Percent	Response Count
Hide replies a	100.0%	7

1. Technical Writing	Tue, Jun 22, 2010 11:24 AM	Find...
2. blast design	Mon, Jun 21, 2010 10:51 PM	Find...
3. ability to meet short deadlines with limited sleep	Fri, Jun 18, 2010 1:57 PM	Find...
4. Inter-personal skills (Communication, Personel Management, etc.)	Fri, Jun 18, 2010 10:43 AM	Find...
5. planning/design	Thu, Jun 17, 2010 6:46 PM	Find...
6. ArcGIS	Mon, Jun 14, 2010 1:05 PM	Find...
7. Communication	Mon, Jun 14, 2010 12:33 PM	Find...

Hide replies b	100.0%	7

1. Technical Communication (Oral)	Tue, Jun 22, 2010 11:24 AM	Find...
2. surveying	Mon, Jun 21, 2010 10:51 PM	Find...
3. quick thinking and problem solving	Fri, Jun 18, 2010 1:57 PM	Find...
4. Construction Materials Properties	Fri, Jun 18, 2010 10:43 AM	Find...
5. directing work	Thu, Jun 17, 2010 6:46 PM	Find...
6. Database - Programming/queries	Mon, Jun 14, 2010 1:05 PM	Find...
7. Computer Skills	Mon, Jun 14, 2010 12:33 PM	Find...

Hide replies c	100.0%	7

1. Blasting Short Course and Semester Class	Tue, Jun 22, 2010 11:24 AM	Find...
2. coal quality data/gathering and blending	Mon, Jun 21, 2010 10:51 PM	Find...
3. understanding of economics	Fri, Jun 18, 2010 1:57 PM	Find...
4. Mathematics	Fri, Jun 18, 2010 10:43 AM	Find...
5. communicating	Thu, Jun 17, 2010 6:46 PM	Find...
6. Mining regulations/permitting/water/access	Mon, Jun 14, 2010 1:05 PM	Find...
7. Time Management	Mon, Jun 14, 2010 12:33 PM	Find...

Hide replies | d | 85.7% | 6

1.	All math based courses	Tue, Jun 22, 2010 11:24 AM	Find...
2.	pumping	Mon, Jun 21, 2010 10:51 PM	Find...
3.	critical reading and writing	Fri, Jun 18, 2010 1:57 PM	Find...
4.	Scheduling and sequencing	Fri, Jun 18, 2010 10:43 AM	Find...
5.	computer skills	Thu, Jun 17, 2010 6:46 PM	Find...
6.	Mine Planning	Mon, Jun 14, 2010 1:05 PM	Find...

Hide replies | e | 71.4% | 5

1.	All geology based courses	Tue, Jun 22, 2010 11:24 AM	Find...
2.	pit design	Mon, Jun 21, 2010 10:51 PM	Find...
3.	dedication and reliability	Fri, Jun 18, 2010 1:57 PM	Find...
4.	time management	Thu, Jun 17, 2010 6:46 PM	Find...
5.	Excel/Access	Mon, Jun 14, 2010 1:05 PM	Find...

answered question	**7**
skipped question	**1**

Note that these are the TOP ranked areas from the 7 respondents

Note that these are the second ranked areas from the 7 respondents etc

2. List up to five technical skills or areas of academic training in your undergraduate education that you wish you had received (that would have help you in your career) Download

		Response Percent	Response Count
Hide replies	a	100.0%	8

1.	More on exploration. I am more interested in starting my own mine and paying myself in gold, rather than taxable toilet paper.	Wed, Jun 30, 2010 2:25 PM	Find...
2.	Training in Microsoft Office (specifically Excel)	Tue, Jun 22, 2010 11:24 AM	Find...
3.	modern surveying	Mon, Jun 21, 2010 10:51 PM	Find...
4.	MORE hands-on mining experience!	Fri, Jun 18, 2010 1:57 PM	Find...
5.	Claims and Dispute Resolution	Fri, Jun 18, 2010 10:43 AM	Find...
6.	communicating effectively with different personality types	Thu, Jun 17, 2010 6:46 PM	Find...
7.	Mining Laws - Federal & State & permitting	Mon, Jun 14, 2010 1:05 PM	Find...

Hide replies	b	62.5%	5

1.	slope stability	Mon, Jun 21, 2010 10:51 PM	Find...
2.	Project Management	Fri, Jun 18, 2010 10:43 AM	Find...
3.	time management	Thu, Jun 17, 2010 6:46 PM	Find...
4.	Basic Statistics	Mon, Jun 14, 2010 1:05 PM	Find...
5.	drafting	Mon, Jun 14, 2010 12:33 PM	Find...

Hide replies	c	12.5%	1

1.	Database	Mon, Jun 14, 2010 1:05 PM	Find...

Show replies	c	12.5%	1
Hide replies	d	12.5%	1

1.	Programming	Mon, Jun 14, 2010 1:05 PM	Find...

Hide replies	e	12.5%	1

1.	Mine Planning Software - Vulcan/Minesight	Mon, Jun 14, 2010 1:05 PM	Find...

Appendix E2 – Employer Survey, November 2009
Responses: 6

University of Alaska Fairbanks
College of Engineering and Mines
Department of Mining and Geological Engineering
Continuous Quality Improvement and Programs Assessment Survey

Mining Engineering Program

The University of Alaska Fairbanks' Mission Statement:

"*The University of Alaska Fairbanks, as the nation's northernmost Land, Sea, and Space Grant university and international research center, advances and disseminates knowledge through creative teaching, research, and public service with an emphasis on Alaska, the North and their diverse peoples."*

The Mining Program Mission Statement

As the nation's northernmost accredited mining engineering program, our mission is to advance and disseminate knowledge for exploration, evaluation, development and efficient production of mineral and energy resources with assurance of the health and safety of persons involved, and protection of the environment, through creative teaching, research, and public service with an emphasis on Alaska, the North, and its diverse peoples.

The Mining Program Objectives

To graduate competent engineers:

- *who are prepared for employment in the mineral and energy industries*
- *who are prepared to solve problems germane to Alaska, and*
- *who are prepared for graduate studies at the masters or doctoral level.*
-

To advance and disseminate knowledge through competent faculty:

- *who teach and mentor students*
- *who conduct creative research relevant to the needs of the State of Alaska, and*
- *who are engaged in public service to enhance the lives of the diverse peoples of the North.*

Survey Questions

1. You are a/an
   1) __ Student currently enrolled in the Mining Engineering program
   2) __ Mining Engineering program alumnus
      Degree Earned _____ Year Graduated _____
   3) __ University faculty member

4) __ Employer/supervisor of engineering student intern or alumnus
5) __ Other (list _____)

2. If you entered a (2) in question 1., indicate your current subject area of employment:

1) __ metallic mineral exploration and metal mining industry
2) __ industrial mineral exploration and mining industry (including sand, gravel, etc.)
3) __ engineering design and construction industry
4) __ petroleum industry
5) __ other private sector (specify_____)
6) __ public sector
7) __ academia

3. In order to ensure Continuous Quality Improvement of Mining Engineering program and assess the program for accreditation, the expected outcomes of the program must be defined, measured, and evaluated. Graduates of the program also are expected to demonstrate that they have mastered these skills.

Place a number from 1 to 5 to indicate in your opinion the level of significance of the outcome to the practice of engineering with 1 = minor significance, 3 = moderately significant, and 5 = extremely significant. For each of these expected skills indicated the level that you (the alumnus/the employee) have/has achieved on a scale of 1 to 5 (with 1 = unsatisfactory, 3 = average, 5 = exceptional mastery of skill or subject matter).

Outcomes/Skills	***Level of Significance Expected***	***Level of Skills Achieved***
an ability to apply knowledge of mathematics, science, and engineering		
an ability to design and conduct experiments, as well as to analyze and interpret data		
an ability to design a system, component, or process to meet desired needs		
an ability to function on multi-disciplinary teams		
an ability to identify, formulate, and solve engineering problems		
an understanding of professional and ethical responsibility		
ability to communicate effectively		
the broad education necessary to understand the impact of engineering solutions in a global and societal context		
a recognition of the need for, and ability to engage in life-long learning		
a knowledge of contemporary issues		
an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice		

4. How long have you (he/she) been employed with the firm/organization __ yrs. __ mos.

5. Are you an E.I.T. (Engineer In Training)? Yes __ No __

6. Are you a P.E.(Professional Engineer)? Yes __ No __.
   If yes, field of registration _____

7. What is your (alumnus/ the employee's) current salary?
   __ $30k-$40k/yr, __ $40k-$50k/yr, __ $50k-$60k/yr, __ $60k-$70k/yr; __ $70k-$80k/yr, __ more than $80k/yr

8. What was your (alumnus/the employee's) entry level starting salary?
__ $20k-$30k/yr, __ $30k-$40k/yr, __ $40k-$50k/yr, __ $50k-$60k/yr; __ $60k-$70k/yr, __ more than $70k/yr

9. How many employees are there in your firm/organization?
___ Less than 10 ___ 10- 99 ___ 100 -1000 __ Over 1000

10. Approximately how many mining engineers are employed by your firm? ____

11. Approximately how many of these are UAF alumni? ____

12. Are you (the alumnus/the employee) currently working in the profession for which you received your undergraduate degree? ___ Yes ____ No

13. Indicate the opportunities for professional development afforded to employees of your firm or organization:
    a. ___ Leave with pay or other support for advanced degrees.
    b. ___ Formal preparation training for the Professional Engineering Examination.
    c. ___ In-service management training.
    d. ___ Paid travel for attendance at professional society meetings.
    e. ___ Support for the preparation of published articles and presentations at professional society meetings.
    f. ___ Other (list)

_____

14. List up to five in priority of the most significant technical skills or areas of academic training that are necessary for the performance of your (alumnus/employee's) job:
    a.
    b.
    c.
    d.
    e.

15. List the five least significant technical skills or areas of academic training that you had at
UAF during your undergraduate education:
a.
b.
c.
d.
e.

16. List up to five technical skills or areas of academic training in your undergraduate career
that would have enhanced your (alumnus/employee's) opportunities for career advancement:
a.
b.
c.
d.
e.

17. As an alumnus/employer how would you rate the graduates of the program that you
are responding to with respect to graduates from other institutions?
a. ____ Generally less satisfactory than most engineering graduates
b. ____ Generally equivalent to most engineering graduates
c. ____ Generally superior to most engineering graduates

18. In addition to the demonstrated techniques, skills and abilities listed above (a-k), list any or all of the subject areas that you think are necessary to distinguish the graduates of the mining program from other engineering graduates from UAF or from engineering programs at other institutions:
a. ____ Knowledge of the specific energy and mineral resources of Alaska
b. ____ Knowledge of the principles of arctic engineering and operations in cold climates.
c. ____ None: no distinguishing knowledge necessary
d. ____ Other (List)

Survey Responses in Curriculum Categories (Employer, 6 responses)

Technical Areas **Most Significant** to their Jobs (ranked ordered, 1 - 5)

1.	Computer database, competency; ventilation; Computer assisted modeling; mine planning; organizational skills;mgmt skills
2.	communi. Skills;engg skills - design/rock mech/blastin/survey;general engg&physics;ground control/geologic engg;mine econ;ventilation
3.	computer skills;computer/tech skills;geotech;project scoping&develop. Mgmt;rock mech/ground support;specific mining engg skills
4.	electrical;electrical/mech equip design;general engg skills;problem solving;project mgmt;technical writing&communic.
5.	econ, surv,chem,ethics,stats, environ;knowledge of mining equip;people skills;tech&business writing

Least Significant Technical Areas (ranked ordered, 1 - 5)

1.	social studies; underground mining;art
2.	biology; surveying;music
3.	first 2 yrs of courses except mining;history
4.	public speaking;PE

Technical skills that would have enhanced alumni careers (ranked ordered, 1 - 5)

1.	ethics; technical writing&communic; communi. Skills; strip mining; mgmt type classes
2.	computer training; mgmt traing; coal prep; permitting
3.	emergency response; equip use, planning, sched; slope stability - soils
4.	environmental studies; econ. Analysis; compter 3D design
5.	Leadership; GPS

Appendix F – Alaska Miners Association Audience Survey

Note: Survey done in May every year (since 2007) at the presentation of the senior design project.

MIN 490: SENIOR DESIGN PROJECT
ASSESSMENT BY AUDIENCE

DATE: _____ (please fill in) Venue: Alaska Miners Meeting

For accreditation purposes, we need to assess student ability in certain areas. You would help us tremendously if you rate the students/project on a scale from 1 to 5, 1 being least applicable and 5 being most applicable. **If you are unsure, it is okay to leave a blank**.
Based on the technical content and oral presentation of project, please rate the project/students on the following abilities/items:
Did the students/project demonstrate that …

Outcome	Rating (1 to 5)
(a) .. they could apply their mathematics, science and engineering skills?	
(c) .. they could engineer a design to meet desired goals?	
(d) .. they could work as a team?	
(e) .. they could recognize and understand problems and solve them?	
(x) .. they were proficient in mining engineering topics?	
(g) .. they could communicate effectively?	
(j) .. that they had a knowledge of contemporary issues?	
(k) .. they had modern technical skills (computer aided mine design, spreadsheets etc) that are necessary for engineering practice?	
l1) .. they had knowledge of mining engineering in the arctic and subarctic conditions	
l2) .. they had knowledge of environmental issues of the arctic	

Please rate the student/project on the content: 1 being poor and 5 being excellent

Mining method(s)	
Ventilation	
Rock Mechanics	
Economics	
Equipment	
Other (fill in)	

Please give an overall rating on the quality (1 being bad and 5 being great):
Any other comments?

MIN 490: Senior Design Project Date:_____

ORAL PRESENTATION ASSESSMENT

Please rate each component of today's presentation by circling one of the choices:

1. Slides were Visible Mostly visible Not Visible
2. The amount of words on the slides were too many just right too few
3. Slide design with respect to readability was good ok bad
4. Voices were generally Loud ok Muffled
5. Clarity of voice Clear ok Mumbling
6. Eye contact Good/covered the room ok Looked down or at slides
7. Flow of content Logical sequence ok No logical sequence
8. Content was sufficiently deep/informative ok shallow/glossed over many things
9. Answers to questions showed knowledge were ok were unsatisfactory
10. Pace of presentation was slow just right rushed
11. Overall, how would you rate the presentation? _____ out of 5, 5 being the best possible.

Any advice on presentation skills?

Appendix G – Independent Reviewer of the 2008 Senior Design Project

Background: Tim Arnold was VP/GM of the Kensington mine when he provided the data for the 2007-2008 mine design project. He moved to General Moly in 2008. He was emailed the report in May 2008. The email was in addition to his verbal praise for the senior mine design project.
From: Tim Arnold [TArnold@generalmoly.com]
Sent: Thursday, June 05, 2008 1:41 PM
To: Rajive Ganguli
Subject: RE: Mine design

Thanks for the report. The title is brilliant. I hope they got an A. It is very accurate in my opinion.

Tim
-----Original Message-----
From: Rajive Ganguli <ffrg@uaf.edu>
Sent: Monday, June 02, 2008 4:00 PM
To: TIMOTHY ARNOLD <TArnold@generalmoly.com>
Subject: Mine design

Tim,

Hope you are enjoying your new job.

Despite not being in Alaska anymore, I thought you may still get a kick from seeing the "unknown" Alaskan mine our senior students designed for their senior project. Here is there final report.

Thanks,

Rajive Ganguli, Ph.D. P.E.
Associate Professor of Mining Engineering University of Alaska Fairbanks
http://www.faculty.uaf.edu/ffrg/
Office: 317 Duckering
Phone: 907-474-7212
Fax: 907-474-6635
Mailing Address: PO Box: 755800
Fairbanks, AK 99775

Appendix H – Log of Continuous Improvement Activities

Continuous Improvement in Quality
List of Actions

Spring 2009

1. Faculty development
    a. ABET training
        i. Rajive Ganguli went to assessment symposium
    b. Other
        i. Two faculty underwent 40 hours VULCAN training
        ii. All faculty attended conferences
2. Faculty met several times to review program. One meeting included program Advisory Board
3. Course Assessment rubrics developed for MIN 482, 489, 490
4. Program Assessment rubrics development initiated
5. The two arctic outcomes merged into one.
6. Computer Lab upgraded
    a. 5 new computers
    b. Costmine software added for MIN 408 and 489/490
7. Silver Fox Mine rehabilitated
    a. An estimated $70,000 was spent rehabilitating the Silver Fox mine.
8. Mining Program amended after a thorough review of content.
    a. Removed ES 201, MIN 106 and 206. Added two new courses MIN 225 and 226. Enhanced MIN 407 by 1 more credit. This will ensure that statistics and ore reserve estimation are properly covered (MIN 225). MIN 226 will cover mine development
    b. Modified Electives list. CE 603, MIN 415, 646 added
    c. More formal coverage of "arctic" component in various mining classes. Directed homework etc
    d. Non-ABET actions
        i. MIN 484 moved to Fall.
        ii. MIN 433 removed from catalog

Fall 2009

1. Met on 9/1/09 to evaluate:
    a. 08-09 courses
        i. Amended the matrix
    b. Review program educations objectives
        i. Amended the objectives.
2. Monthly faculty meetings
    a. ABET review
3. Submitted MIN program change paperwork.
4. Rubrics developed for assessing all MIN courses.

Spring 2010

1. Purchased GPS units for MIN 202: $65K
2. Spent $3K on GE 261 maps
3. Met 2/11/2010 to review ABET progress and fine tune program learning outcomes
4. New fees imposed on MIN (&GE) lab courses to improve maintenance
5. Silver Fox mine work continued in April with Tom Troxel and several students. Ventilation tubes extended, additional roof bolting, air tram fixed, material scooped, fan fixed
6. Conducted ABET program review on May 17th
    a. PEOs modified
    b. Outcomes coordinators finalized

Summer 2010

1. Alumni re-surveyed following review of review of 2009 survey results. It was discovered that there was no information on professional development of alumni. Therefore, a new survey was developed and administered in the summer of 2010.
2. Funds were identified to upgrade DUCK 310 computer laboratory. Approximately $25,000 was spent to obtain 11 new computers and install overhead projectors. This will enhance MIN 482 delivery.

Fall 2010

1. Approval of PEO by SME Student Chapter on 9/9/10 (19-0)
2. Installation started for the donated leaky feeder radio system (from Tunnel Radio to Silver Fox mine) in the summer.
3. Following Carl Locke's (ABET consultant) visit Oct 18-19, changed the PEO's slightly to make them better fit 2011 criteria.

Spring 2011

1. MIN Program Assessment on 2/4/2011
2. Rock Mechanics lab upgrade (~$7500): Maintenance (grinder, supplies). Purchase (rock coring machine)
3. Direct Shear device (~$7000) for GE 365 lab
4. Purchased bobcat (~$15,000) for Silver Fox Mine
5. MIN faculty meeting to discuss program on 5/3/2011
6. Ventilation lab ($60K): air flow training unit etc
7. MIN ABET preparation meeting 5/3/11
8. Exit interview with graduates: 5/6/11, Conducted by GE faculty
9. MIN Program Assessment meeting 5/19/11

Appendix I – Samples of Outcome and Course Assessments

Learning Outcome #K: An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Performance Criterion	Strategies	Assessment Method(s)	Source of Assessment	Time of Data Collection
1. Demonstrate proficiency over Computer Aided Mine Design (CAMD) techniques	MIN 482	HW, Test, Surveys	MIN 482	2007-2011
2. Demonstrate proficiency in basic and specialized software skills	MIN 302, 370, 454, 482, 490W	HW, Test	MIN 302	2008-2011
			MIN 370	
			MIN 454	
			MIN 482	
			MIN 490W	
3. Use modern engineering tools such as digitally controlled loading machines and total stations, and techniques	MIN 202, 313, 370	Lab reports, hw	MIN 370	2008-2011

Performance Criterion#1: Since 2007, every student has gone through the entire mine design process in VULCAN, a 3D mine design software, and demonstrated their competency in computer aided mine design through their individual project in MIN 482. Student competency included creating a drillhole database, block modeling, reserve computation, mine layout and basic computer aided design skills. During this time, the course content, student requirements and assessment methodology have all evolved to improve, and better track learning outcomes. This is described in more detail in MIN 482 assessment documentation.

Performance Criterion#2: Analysis of student work reveals widespread use of basic word processors and spreadsheets in numerous homework and projects in the listed courses, thereby, demonstrating their skills in basic software. Additionally, they are required to use specialized software such as RockWare, CostMine, MS Project, Quick Quant and QBS in some courses. All students have demonstrated the ability to handle basic and specialized software.

Performance Criterion#3: The mining engineering curriculum exposes students to modern tools and techniques. However, assessment of MIN 202: Mine Surveying in 2008 had revealed that students did not get adequate training on Total stations due to equipment shortage. The changes made in 2009 to address this shortcoming included addition of a new GPS total station, and splitting of the class into two sections. This helped improve student time on modern survey equipment. Additionally, a field trip was made to Pogo mine for students to experience a robotic

total station. This was followed by addition of a GPS base and rover in 2010. The newer Leica GPS equipment was integrated in the lab in Fall 2010. In MIN 370: Rock Mechanics, all students use and demonstrate proficiency over digitally controlled loading machines.

All students have to be proficient in modern tools for certain (mandatory) laboratory work. This includes survey total stations for MIN 202 and digitally controlled loading machines for MIN 370. MIN 313, on the other hand, covers techniques that help understand how geologic materials behave in mineral processing environment. This outcome was successfully delivered in the most recent offering in 2009 in MIN 313, when 1 student was at the apprentice level, while the remaining 3 were at the proficient level.

Overall Conclusion

Modern tools, techniques and engineering skills are spread throughout the curriculum, with student success in most courses being tied to their familiarity with these techniques/skills. Assessment methods have evolved to better pinpoint and improve student learning in MIN 482. Addition of a new section and investment in new equipment helped improve outcomes in MIN 202. A review of student work across the curriculum reveals that they have the modern skills, spanning a variety of areas such as mine surveying, computer aided mine design and rock mechanics, necessary to enter the workplace.

Evaluation of

MIN 482: Computer Aided Mine Design

This course meets Outcomes C and K. The rubrics for assessing the two outcomes are given below:

ASSESSMENT RUBRICS

Outcome	**Criteria**	**Strategy***	**Levels of achievement**		
			Proficient(2)	*Apprentice (1)*	*Deficient(0)*
Outcome C. Ability to design system, component or process to meet needs.	a) Ability to design a Vulcan drillhole database from common spreadsheet data	Final Project,, Pre/Post Course Survey	Definition: i) Able to apply the knowledge of tables and fields to *design* a database ii) Able to *create* a drillhole database from drillhole information iii) Uses synonyms; validates database. iv) Documents (including justification as appropriate) design.	Definition: i) Knowledge of tables and fields ii) Broadly familiar with the process to be followed to develop the database from drillhole data. However, unable to execute this knowledge.	Definition: i) Does not understand principles of database design, i.e. fuzzy on the relationship between fields and tables ii) Does not know the broad process for developing a database from drillhole data
	b) Ability to develop a block model in VULCAN	Final Project,, Pre/Post Course Survey	Definition: i) Able to apply the knowledge of block model into developing a simple block model ii) Can manipulate the block model using scripts iii) Documents (including justification as appropriate) design.	Definition: i) Knowledge of the concept of a block model ii) Knowledge of the broad process to be followed for developing a block model	Definition: i) Does not know or is fuzzy about the concept of a block model ii) Fuzzy knowledge of the broad process to be followed for developing a block model
	c) Ability to create major mine structures such as stopes and compute reserves in VULCAN	Final Project, Pre/Post Course Survey	Definition: i) Can create stopes, ramps and shafts ii) Can compute reserves for designed structures, i.e. knows how to use the "advanced reserves editor" iii) Documents (including justification as appropriate) design.	Definition: i) Aware of Vulcan concepts (such as polygons, primitives and ramp editor) that go into designing stopes, ramps and shafts. However, has problems using these features. ii) Aware of the advanced reserve editor and scripting to determine stope and block values. However, has problems using these features.	Definition: i) Does not know or is fuzzy about how to create stopes, ramps and shafts, and how to compute volumes/tonnages.

	d) Able to go through a cohesive design process and create a digital mine	Final Project	Definition: i) Goes through incremental steps towards mine design ii) Explains the design process. Documents and justifies design.	Definition: i) Aware of the individual components of mine design process. ii) Not aware of the iterative nature of mine design	Definition: i) Does not know the process of developing drillhole data into a digital mine

*: The strategy that is assessed is shown underlined

ASSESSMENT RUBRICS

Outcome	Criteria	Strategy*	Levels of achievement		
			Proficient(2)	*Apprentice (1)*	*Deficient(0)*
Outcome K: The ability to use appropriate modern techniques, skills and tools, including computer applications necessary for engineering practice.	a) Computer Aided Mine Design	Final Project, Pre/Post Course Survey	Definition: ii) Creates a drillhole database iii) Applies inverse-distance squared estimation iv) Creates a block model v) Creates stopes, ramps and shafts. vi) Computes grade and tonnage for the mine. vii) Documents design	Definition: ii) Understands that development of a mine model requires the components: drillhole database, block modeling, grade estimation and mine structure (stopes, ramps, shafts etc) design. iii) Has broad knowledge about the individual components of mine design	Definition: i) Does not know what constitutes a mine model in VULCAN
	b) Basic Computer Aided Design knowledge	Homework#1, Final Project	Definition: i) Meets "Apprentice" standards ii) Can create and edit complex 3D objects.	Definition: i) Understands the concept of layers, lines and polygons. ii) Able to draw and edit simple lines, polygons.	Definition: i) Does not know or fuzzy about concepts behind layers, lines, polygons ii) Cannot create a basic line, polygon and layer. Cannot change attributes of basic 3D objects

*: The strategy that is assessed is shown underlined

EVALUATION

Evaluation Cycle (Fall 2007, 4 students)

Direct Assessment (Evaluation of student work)

This occurred prior to the development of the current form of assessment rubrics.

In the Fall 2007 offering, student work (homework and project) submissions were Vulcan files, though the final project also required documentation. The instructor reviewed student work in VULCAN. During the assessment process, the instructor realized a short coming in homework and project requirements. Documentation was required since 3D mine design software are notoriously difficult to learn. Therefore, it was in the student's interest to keep a record of the process of mine design. However, since documentation is not the same as a report that justifies and explains the design, no insight could be gained into true student understanding of the concepts. 100% of the students, had, however, completed their project, i.e. they were able to design a mine from basic drillhole data. Therefore, Outcome K was realized for 100% of the students. Except for justification of design, Outcome C was also achieved.

Indirect Assessment (Evaluation of Pre and Post Course Surveys)

This occurred prior to the development of the current form of assessment rubrics.

Analysis of pre and post course surveys showed 100% of the students thought their knowledge of 3D mine design increased from taking the course. In every category except "Production Scheduling", they said they had "Some in-depth knowledge of some of the intricacies." "Some in-depth knowledge of some of the intricacies" was an appropriate level for an undergraduate course. The surveys were developed prior to the developed of the assessment rubric and, therefore, the levels do not correspond directly to those of the rubric. Production scheduling was only briefly covered due to time constraints.

<u>ACTION TAKEN</u>: Documentation requirement was modified in Fall 2008, to include justification and explanation of the design process. Production scheduling was eliminated from the syllabus since it was felt that the little extra time was better spent on block modeling and stope design, rather than on a shallow coverage of production scheduling.

Evaluation Cycle (Fall 2008, 4 students)

Direct Assessment (Evaluation of student work)

This occurred prior to the development of the current form of assessment rubrics.

100% of the students met both Outcomes C and K at the "Proficient" level. All provided explanations and justifications for their design.

Indirect Assessment (Evaluation of Pre and Post Course Surveys)

This occurred prior to the development of the current form of assessment rubrics.

Analysis of pre and post course surveys showed 100% of the students thought their knowledge of 3D mine design increased from taking the course. Students said they had "Some in-depth knowledge of some of the intricacies" in every category. "Some in-depth knowledge of some of the intricacies" was an appropriate level for an undergraduate course.

<u>ACTION TAKEN</u>: After the assessment rubrics were developed in Spring and modified in Fall 2009, it was decided to modify the homework, project and pre/post surveys to better align them with the developed rubrics.

Evaluation Cycle (Fall 2009, 5 students)

Direct Assessment (Evaluation of student work)

All students were able to create 3D objects and modify them, thereby demonstrating proficiency in basic CAD. Most were also able to go through the comprehensive mine design process, though, all made minor errors. Some students did not provide all the required documentation, especially in the areas of reserve estimation.

Indirect Assessment (Evaluation of Pre and Post Course Surveys)

Three students had some exposure to a 3D design software (probably AutoCAD) prior to taking the class. However, none had any experience with Vulcan, or with the general computer aided mine design process that includes creation of drill hole database, block modeling, creation of mine structures and computation of reserves. After taking the course, all students considered themselves proficient in basic CAD and database development. Most of the students considered themselves proficient in block modeling, ability to design structures and compute reserves, and in overall mine design. However, one or two students considered themselves an apprentice in those areas.

ACTION TO BE TAKEN: Between the lack of documentation and post course survey, it appears that some students did not fully grasp the block modeling and reserve estimation process. It is not clear if that is because of lack of individual effort or if the topic was not covered sufficiently. In either case, it will not hurt to cover those topics in more detail.

Evaluation Cycle (Fall 2010, 5 students)

Direct Assessment (Evaluation of student work)

Student requirement was modified at the beginning of the semester. An important change was assigning a final test (closed book and open book sections) instead of a report. Additionally, most of the homework underwent some re-design. All students were able to create 3D objects and modify them, thereby demonstrating proficiency in basic CAD. All were able to develop a block model and major mine structures, though the homework on estimation algorithms identified deficiencies in their understanding. The estimation algorithms were covered again in class and, therefore, it was not surprising to eventually (final test) see an improvement in learning. All were also able to demonstrate an ability to estimate reserves. The time constrained final test, however, showed that only three out of the five (60%) were proficient with every aspect of the course (Outcome C). Two students, who admitted to not spending time on the class, performed at the apprentice level. Through class exercises, all showed an ability to use a mine design software (Outcome K).

Indirect Assessment (Evaluation of Pre and Post Course Surveys)

All students returned their pre-course surveys, while only three returned their post-course surveys. One student indicated some prior experience with Vulcan. In the post course surveys, all said they were proficient in the various components of Vulcan, though one indicated they were an apprentice on comprehensive mine design. At the end of the semester, all indicated an increase in proficiency in every aspect of the course.

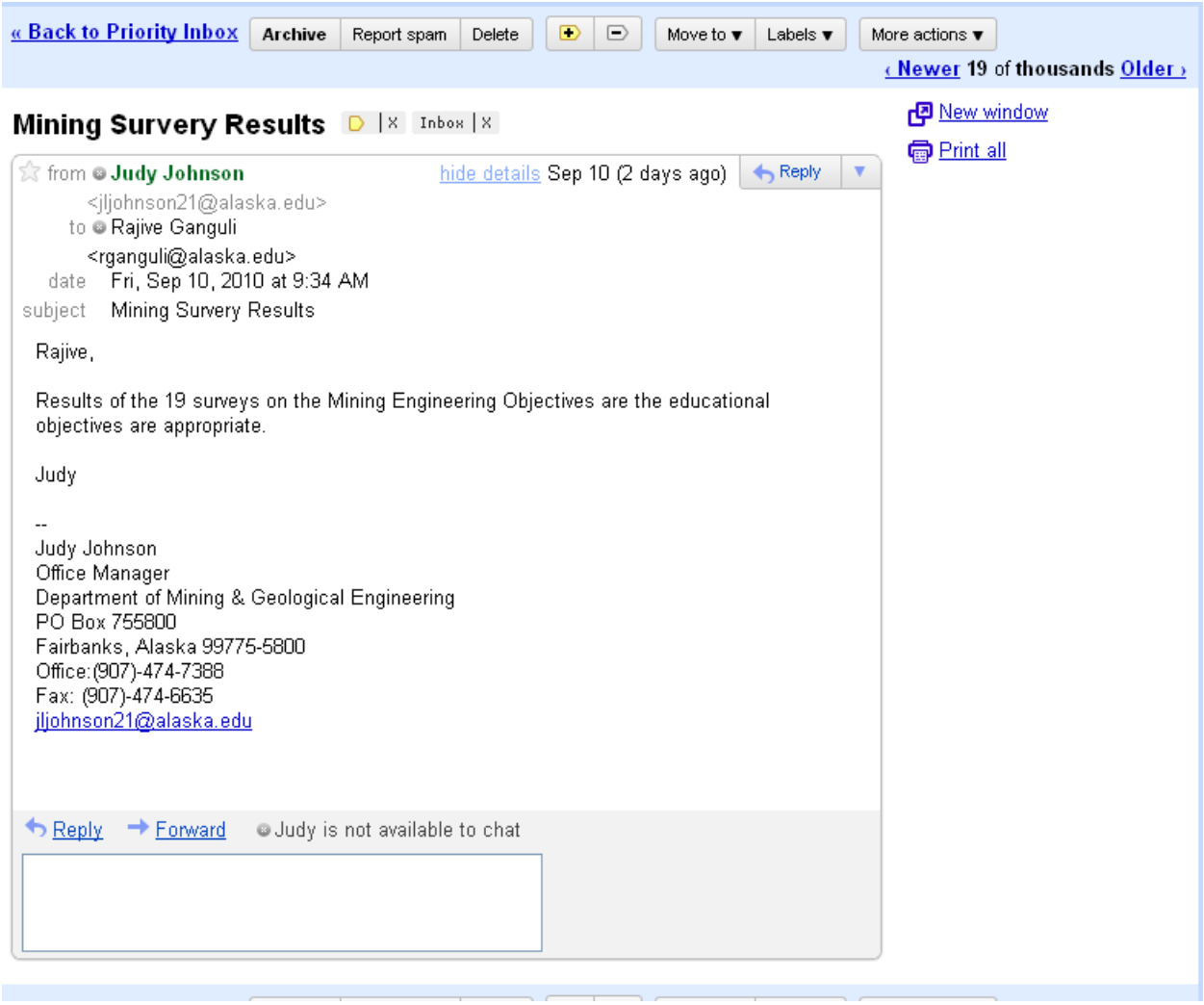
Overall: Outcome C is being met at the proficient level by 60%, while Outcome K is being met at the proficient level by all. Forty percent are at the apprentice level with Outcome C.

ACTION TO BE TAKEN: None.

Appendix J – Approval of the Program Educational Objectives

By current BS (Mining Engineering) students

The amended PEO's were voted on by the SME Student Chapter on 9/9/2010. They were approved 19-0.



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‹ Newer 19 of thousands Older ›

Mining Survery Results | X | Inbox | X

New window

Print all

from **Judy Johnson** <jljohnson21@alaska.edu> hide details Sep 10 (2 days ago) Reply

to Rajive Ganguli <rganguli@alaska.edu>

date Fri, Sep 10, 2010 at 9:34 AM

subject Mining Survery Results

Rajive,

Results of the 19 surveys on the Mining Engineering Objectives are the educational objectives are appropriate.

Judy

--
Judy Johnson
Office Manager
Department of Mining & Geological Engineering
PO Box 755800
Fairbanks, Alaska 99775-5800
Office:(907)-474-7388
Fax: (907)-474-6635
jljohnson21@alaska.edu

Reply | Forward | Judy is not available to chat

By the alumni

Recent graduates (since 2005) of the BS (Mining Engineering) program voted in 2010 to the amended objectives. See Appendix E.

By the Advisor Board

Mining Engineering/Geological Engineering/Mineral Industry Research Laboratory Advisory and Development Council (ADC) Joint Meeting

Friday, November 5, 2010 11:00am-12:00pm & 1-2pm
Room 305 Sheraton Anchorage Hotel
Duckering 301B – Teleconference Mtg. #4530181

Advisory Board

Mining Engineering

Alan Renshaw
Vice President
Usibelli Coal Mine

Ron Plantz
Human Resources Manager
Greens Creek Mine

Lauren Roberts
Vice President
Fort Knox Mine

Todd Roth
General Manager
Pogo Mine

Paul Henry
Chief Executive Officer
Anglo Alaska

Steve Borell
Executive Director
Alaska Miners Association

Geological Engineering

Rod Combellick
Deputy Director
AK Dept of Geo. Geophy. Survey

Steve Masterman
Northern Region Geologist
AK Dept of Transportation

Rohn Abbot
Senior Vice President
Shannon & Wilson

Harry Noyes
Consultant

MIRL

Warrack Wilson
Vice President
Silverado Gold Mines Inc

Present (in person or teleconference): Rajive Ganguli, Rod Combellick, Ron Plantz, Alan Renshaw, Doug Goering, Steven Masterman, Todd Roth, Sabry Sabour, Dan Walsh, Dan White, Lauren Roberts, Judy Johnson, Gang Chen, Scott Huang, Debu Misra, Margaret Darrow, Steve Lin

Absent: Paul Henry, Rohn Abbott, Harry Noyes, Warrack Wilson, Steve Borell

1. Welcome and Introduction of Attendees:

Alan Renshaw, Chair of the Advisory Board, opened the meeting. Members in Fairbanks, Anchorage and by audio conference sign in.

2. Approval of Agenda.

Dan White requested to discuss agenda 4 & 7 together. It was approved.

3. Announcements

a. Changes in advisory board:

Departing Members:

Karl Hanneman and Mary Nordale departed the board. Suggestion of a farewell gift (gold pan) is given to them to thank them for their time.

New members:

Todd Roth (General Manager, Pogo Mine) & Paul Henry (CEO Anglo Alaska). Paul Henry could not attend – he is in London.

b. New faculty Member

Ted Wilson retired and his replacement is Dr. Sabry Sabour, UAF Mining Engineer Professor.

c. Potential 2+2 program with Mongolia:

Rajive gave an update on the developments with Mongolia. In discussions with the Mongolia government and Rio Tinto about some Mongolia students coming to UAF to study mining engineering. The Mongolian government or Rio Tinto will pay for the students, who could be at the graduate or undergraduate level. More than likely the undergraduate level. Rio Tinto maybe sending someone up here in spring, but so far have not heard from them. In fall more than likely Mongolia will have some people here sponsored by the Mongolia Government. The articulation agreement is

being developed agreement. The students will do 2 years in Mongolia and 2 years at UAF. There are course transfer issues – 2 years in Mongolia may count for less at UAF. Everything is being sorted out as the academic year progresses. Dug stated that this will be modeled after the fairly successful program like China. English has been an issue with the Chinese students. We have 9 Chinese students now in GE. We have a 2+2 agreement with China now.

English could be a problem with Mongolian students too, but the good news is that the 3 Mongolian students in the department have no language issues. 2 students are doing well, the third is new to UAF. One is in Mining and the other is Geological.

4. Dean Doug Goering

Mining & Geological engineering are fitting right into the trend with a 27% increase in enrollment. We have about 70 students in the program now, more students than we have had in MIN & GE in a long time. We filled Ted Wilson's position If we continue to see the program expand we will need to hire more faculty and certainly if mining & GE expands and have more active programs with Mongolia and China. That will be the motivation for more faculty spots in the future. Doug was involved in the Mongolia trip with Rajive and he does think there are a lot of opportunities. He knows the Chancellor is interested partly because of this connection through Rio Tinto and Tom Albanese. The OT officials we talked to including Keith Marshal were very supportive of the program. The money to get the students trained is really not an issue; both the Mongolia Government and OT have a large training budget. OT alone has put $50 million in training and they are targeting a significant amount of that funding is going to drillers, blasters and people who will be working on the ground there. He thinks a significant amount will be going to higher level engineering. There is a real opportunity to get into the education market and for us it is a good deal for the University.
Other big news is Proposition B and the new engineering facilities. He showed a flyer of the expansion of what the building may look like. There is going to be lot of discussion over the next year or two. UAA he does not think will ask for money this year, but he does think next year they will. It remains to be seen with the consulting studies. The consultant is Ira Fink and he has been contacting industries in the state to try to get a feel of what the engineering needs are going to be going forward. Steve Burrell is on his contact list and has been contacted.
If anyone on the advisory board is interested they can contact Steve and let him know, because the time is right in making these contacts.

MIRL Report (Dan White):
Dan White stated that going along with the other comment about raising the graduate profile in Mining & GE research. He briefly stated the history of MIRL and the merging of the programs. The Dean of that time had established the Director as Paul Metz. Paul Metz's 2 year term ended in August. Dan has been meeting with the Mining & GE faculty and one of the models they came up with that has been successful at the University is Alaska Center for Energy and Power, which is the reorganization of energy research. That model was preferred rather than add an added duty to the faculty, to go

externally. We found a half year salary and offered it to Gwen Holdmann who has been very successful as the director of energy research. Dan was charged by the Mining & GE faculty to come up with funding to get someone from outside to come in and serve as director. A lot of exciting things are going on in Mining & GE research in raising the profile internationally, nationally and state. We will pursue this plan and get someone from outside to come in as the director. We have some unique opportunities in Waste Management. Mining & GE is the smallest program in the college right now. There are some pressures as far as labs. We can handle more students. We are trying different things. GE freshman class had about 20 students; Mining had 12-15 students.

5. ABET Preparation:

   a. GE: Scott Huang: Looks like GE is doing a good job. GE has changed the educational objectives by wording. All preparation we have been doing, the language should be good. The consultant suggested we use the procedures where we involve students, alumni, friends, and faculty. Another part is the alumni survey, which we did last year on the old objectives. We need to come up with new wording for the survey questions.

   Scott Huang will get with people about coming up with survey questions. Objectives are supposed to be achievements of the students and the old objectives did not mean that idea, so new objectives were created.

The meeting adjourned for lunch at noon. Reconvened at 1 pm.

   b. MIN: Rajive Ganguli: Presented the program educational objectives for MIN, and sought Board approval. These are almost identical to those approved in the summer. The only changes were minor wordsmithing to make them sound “futuristic”, i.e. objectives to be met in to the future. Rajive explained the new standards and the feedback from the ABET consultant hired by the college. The Board approved the program educational objectives.

   c. Review of Programs: Alan stated that the MIN curriculum does not need to be changed as it looks like a good solid program. Other board members concurred. ABET should not have a problem at all with it.

6. Curriculum Activity summary

   a. GE: Debu Misra: No major curriculum changes made, no need to change. Erosion Mechanics and Control was added as a technical elective, not part of the core curriculum.

   b. MIN: Rajive Ganguli:
      i. Program changes: We made some changes, we added a course on quantities methods for mining, and we added content to mine reclamation class. We removed the computer programming class which the students thought they did not need (per past alumni surveys).

ii. The second change we made was in establishing a minor in Mining Engineering. We have one mechanical engineering student who is minoring in mining.

iii. Rajive did not think that another alumni/employer/student survey was needed to pass the minor wording changes made after the consultant's visit last month. Alumni, employers and students were surveyed in 2009 and 2010 (a few months ago). He does not want to fatigue them. The Board agreed that the changes in PEO's were not in content. The objectives are essentially the same and, therefore, another survey was unnecessary.

Other

Accreditation: Rajive stated we have everything in control. We have invested a lot of time. It can be frustrating at times. It is not about just teaching students, it is about proving they were taught. ABET will get the report and will probably get about 25 folders, demonstrating what we taught and how we achieved the outcomes, a breakdown of different courses etc. We have a good system in place now.

Meeting adjourned at 1:45 pm

Appendix K – Minutes of Faculty Meetings

Mining Engineering Faculty
Program Review Meeting
12-1pm, 5-19-2011

Minutes

Present: Sukumar Bandopadhyay, Gang Chen, Rajive Ganguli, Sabry Sabour, Steve Lin and Dan Walsh

1. The exit interview with the graduating seniors was discussed.
    a. They seemed critical of arctic component. Faculty noted that arctic mining is discussed throughout the curriculum. However, most of it is qualitative as higher level math would be required for design/computations such as thermodynamics of the arctic. The arctic component has never been an issue with past graduating classes. It is covered in many courses, starting with MIN 103. A new course specifically for arctic mining was ruled out –students are required to take too many MIN credits already. The small group of faculty cannot deliver any more MIN credits. CE 603 – Intro to Arctic Engg was discussed. It is currently a technical elective. There was no support among faculty to make it mandatory. Not all graduates stay in Alaska – indeed, the entire class of 2011 is headed to hot/warm climates. It was suggested that MIN 226 could be used to further discuss frozen. Another solution was to include a specific arctic homework in every upper division course.
    b. Students did not think faculty were technically current as some dated information is sometimes discussed in classes. Faculty noted that many concepts in mining haven't changed in decades. Therefore, some material will be dated. However, faculty decided to review their notes and make sure they were technically current.
    c. The faculty noted the low scores assigned to Outcomes F (ethics and professional) and L (arctic). Students do ethics homework in MIN 489 and specifically address ethical issues in their design in MIN 490. State of Alaska PE ethics standards and SME Register Member standards are introduced to them. It was also pointed out that students take an ethics course COMM 300X/NRM 303X/JUST 300X/BA 300X as part of their degree. Faculty decided that this outcome cannot be achieved at the same level as the other outcomes as not that much time is devoted to it (or can be devoted to it) given the other requirements. Guest lectures could also be arranged on ethical issues faced by real world mining engineers.
    d. While discussing the exit interview, the current senior design project was also discussed. It was a frustrating experience as most of the students did not contribute as they should have or had promised to. Therefore, some critical areas, such as access/portal/shaft were left out, though some non-critical areas were covered. May be in the future, the faculty could specify "core" areas that have to be designed.

2. Rajive reminded everyone to update the Learning Outcomes documents with Spring 2011 summaries. Everyone agreed to do so within a week.

MIN Program Assessment Meeting
May 3, 2011

Present: Dan Walsh, Steve Lin, Sukumar Bandopadhyay, Gang Chen, Sabry Hafez and Rajive Ganguli

1. The A-L outcomes folders were discussed. Faculty members reviewed the contents of each folder. Some faculty members realized that they needed to provide content for assessment. They agreed to do so before the end of the semester. All also agreed to update the outcome assessment summary (first two pages in each folder) before the end of the semester.

2. Rajive mentioned that CEM would be displaying student work (hw, tests etc) in separate color coded folders. The faculty thought that was not necessary for the MIN courses since student work would be displayed in two separate ways – in Outcomes Folders and in Course/Instructor Folder. This is more than what other programs are doing. There was no need to display the same material a third way.

3. The exit interview template provided by Rajive was reviewed. Changes were suggested and adopted.

4. The MS Program Assessment Plan developed by Rajive was discussed. Changes were suggested and adopted.

5. Senior design project presentation was discussed. Only presentation happens at AMA. It was suggested that a pre-AMA presentation could be scheduled on campus for 1 pm on the Thurs prior to the AMA presentation. This will serve as a practice presentation. This will be implemented in the next offering.

Faculty Meeting

Department of Mining and Geological Engineering
College of Engineering and Mines
Tuesday January 18, 2011
1:00 – 3:00 pm
Duckering 301B Conference Room

Present: Dr. Rajive Ganguli, Dr. Gang Chen, Dr. Scott Huang, Judy Johnson, Dr. Margaret Darrow, Dr. Steve Lin, Dr. Sabry Sabour, Dr. Sukumar Bandopadhyay

Excused: Dr. Dan Walsh, Dr. Paul Metz, Dr. Debu Misra

Approval of Agenda: Dr. Ganguli asks if there are any additions or changes to the agenda. No changes. Agenda is approved.

Spring Review:

a. A review of how many students are enrolled in Spring 2011 classes was done.
b. A review of TA assignments was conducted.

Spring 2011 TA Assignments:
GE261 Dr. Darrow- TA Travis Haller
ES 209 Dr. Darrow-TA Kyle Obermiller
ES210 Dr. Misra-TA Kyle Obermiller
MIN 370 & ES208 Dr. Chen-TA Daniel Arku

c. Judy stated that the Dean was asking about TA Kumar Raj and was looking at changing the fund on him. Dr. Ganguli stated he would talk to the Dean.
d. Dr. Ganguli stated that the department will have 3 TA's only next semester.
e. Dr. Ganguli stated he is hoping to have additional TA's if a lot of Mongolian students show up. The dean may agree to that.

Planning for next AY:

a. Dr. Metz will buy out part of his time again for next academic year.
b. Dr. Misra will be on sabbatical in the Spring 2012
c. A review of the Fall 2011 schedule was looked at.
d. Dr. Ganguli stated need to add Seminars for Fall 2011 and Dr. Huang will be the instructor.

ABET Reminder:
Complete Fall 2010 assessment finalize Report. Dr. Ganguli will meet with both programs separately.

New requirements for class schedules:
Judy went over the new requirements that have been added to the schedules. Some of the changes include marking down if instructors use DVD/CD's, blackboard, multimedia, stacked/Xlisted.

Other Business:

Room 301B will have NO classes scheduled in it.

Meeting ended 3:00PM.

Faculty Meeting
Department of Mining and Geological Engineering
College of Engineering and Mines
Thursday December 2, 2010
1:00 – 2:00 pm
Duckering 301B Conference Room

Present: Dr. Rajive Ganguli, Dr. Gang Chen, Dr. Scott Huang, Judy Johnson, Dr. Margaret Darrow, Dr. Debasmita Misra, Dr. Steve Lin, Dr. Sabry Sabour.

Excused: Dr. Dan Walsh, Dr. Paul Metz, Dr. Sukumar Bandopadhyay
Approval of Agenda: Dr. Ganguli asks if there are any additions or changes to the agenda. Added c. visitor program.

Reminders:

a. ABET: collect samples of students work this semester and next. The two programs can decide when to meet at the end of the semester or beginning of next semester to do semester end assessments.
b. Equipment List: See attached the equipment request list. The GE program is totaling $11,000 right now. Dr. Chen asked if more can be added to the list. Dr. Ganguli stated yes. If you have items just give them to Dr. Ganguli. Indicate some level of priority.
c. Visitor Program: Dr. Darrow has submitted her visitor paperwork. Dr. Misra will start his in January, because he will not be coming until March or April. Dr. Ganguli suggested that Dr. Misra do the paperwork now. Dr. Sabour stated his visitor will not be coming until May or later. Dr. Ganguli stated that is fine as long as they come before the end of the fiscal year. Dr. Chen asked what we are providing as far as support. Dr. Ganguli stated we are only providing travel support and travel per diem. Dr. Chen and Dr. Huang stated they have possible people coming from China. None of this is guaranteed.

Spring 2011 TA Assignments:

GE261 Dr. Darrow- TA Travis Haller
ES 209 Dr. Darrow-TA Kyle Obermiller
ES210 Dr. Misra-TA Kyle Obermiller
MIN 370 & ES208 Dr. Chen-TA Daniel Arku

Dr. Misra asked that an email be sent to each TA to let them know exactly where they are assigned and have them get with the instructor prior to the start of classes. This will eliminate confusion.

Soft closure:
Judy briefed that the dates are 20 Dec-7 January 2011.

Holiday:
Judy stated she has a list of everyone so far that will be out during the holidays. That way the Dean will know when everyone is out. Judy stated that in the office managers meeting Linda Ilgenfritz stated we do not need a acting department head over the closure.

Other Business:
Textbook adoptions: Judy received an email with courses that have no adoptions listed. She asked everyone to look at the list and let her know if you need a course book ordered.

Course Catalog Updating: Lillian Misel has replaced Tim Stickel. I have contacted her about changes we had submitted last year that were never updated. And the new MIN&GE educational objectives need to be updated in the catalog for ABET.
Judy will be sending out the changes that were submitted last year to everyone to check. If you have changes put it in red, so she knows that it needs to be updated.
Lillian Misel in the registrar's office asked Judy to send the changes to her. The program objectives are a minor change and should be able to be changed without going through the faculty senate. The CEM webpage will be updated.

Mining Survey Room: Dr. Sabour asked about having a mining survey lab. The room currently is not usable for a lab. Dr. Ganguli stated that the Dean is aware of it. The department has been offered rooms, but they are closets and will not work. Dr. Huang suggested asking for a multi-purpose room is the best way to go. Dr. Sabour stated the room needs to have 3 or 4 computers in it. Dr. Ganguli asked Dr. Sabour to write everything he needs, because this is the first in hearing computers are needed. Dr. Ganguli suggested that the current mining survey storage area can get more cabinets.

Dr. Sabour asked about having 2 mining survey labs in Fall 2011. Right now he is doing labs on Sundays, but next year they may not be able to have them on Sunday. Dr. Ganguli stated six hours a week is doable. Dr. Huang stated to be careful that they may conflict with other classes. Labs can be in the morning.

Meeting ended 2:00PM.

Faculty Meeting
Department of Mining and Geological Engineering
College of Engineering and Mines
Thursday October 30, 2010
1:00 – 2:00 pm
Duckering 301B Conference Room

Present: Dr. Rajive Ganguli, Dr. Gang Chen, Dr. Scott Huang, Judy Johnson, Dr. Margaret Darrow, Dr. Debasmita Misra, Dr. Steve Lin, Dr Dan Walsh, Dr. Sabry Sabour.
Approval of Agenda: Dr. Ganguli asks if there are any additions or changes to the agenda.
Summary of Executive Committee Meeting/travel policy:
Dr. Ganguli introduced and welcomed the department new mining faculty, Dr. Sabry Sabour.

Proposed changes to MIN 4080. Dr. Ganguli brought up the newly created MIN course MIN 225. It has content partly covered in MIN 408O. Therefore, he proposed that MIN 408O content be changed to add more advanced content (from Sabry). However, since GE uses MIN 408O, content cannot be changed without discussion with GE. He also proposed that GE program take MIN 225 (instead of STAT 200) since it course covers statistics as relevant to the mineral industry. Scott preferred that nothing be done until after ABET visit next year.

Composition of P&T committee. Make P&T Committee based on feedback, thinking of the CBA language, cluster, unit, discipline that have included all tenure faculty.

Minimum grade requirements. Margaret brought up the impact of C-. She was wondering if MIN & GE should make C the minimum required grade for all courses in the two programs. After discussion, it was decided that no action was needed at this time.

GE Stampede fund disbursement. There are 2 funds, MIN & GE. Since Debu wanted the GE disbursement to be discussed, it was decided that the GE faculty would discuss it internally.

Equipment Issues: Get a list to Rajive $3-10,000, make a list.

Rajive encouraged all faculty to explore if their grad students could take more courses from within the dept.

The Advisory Board Meeting is coming up.

On Dec 1st Rajive will send in the program review consisting no more than 2 pages. Scott will help with GE program review and Dan will help with MinPrep.

Mining & Geological Engineering Department Meeting
28 August 2010

Present: Dr. Ganguli
Dr. Bandopadhyay
Dr. Chen
Dr. Misra
Dr. Darrow
Judy Johnson

See below the summary / action items from today's meeting.

Dr. Sabour will be arriving here 28 Aug and Dr. Chen will pick him up.
Dr. Chen will be acting dept. head while Dr. Ganguli is traveling.

1) Fall 2010 Class cancellations:
* GE 630
* MIN 621 & 637
* MPR 601 & 688

2) TA's Travis Haller- GE 365 & ES 208
Daniel Arku- MIN 202
Kyle Obermiller- GE 420 & 405

3) John King will be a student assistant for Dr. Chen.

4) Matt Bray will teach GE 666.

5) GE 365-Maybe broke into 2 labs but we will wait until after the semester starts to add section 2 if needed.

6) MIN 408 will be discussed later with all faculties.

7) Judy briefed on the following:
Room 310 lab has 11 new computers, the projector screen and all the components are to arrive this week. (Update: screen arrived today)
Judy on vacation over the Labor Day weekend (1-6 Sept)
Sept 16 is CEM BBQ
Sept 23 is CEM faculty and staff convocation room 252 1-2pm
CEM student orientation is 31 Aug 10-11am
Todd Paris will be here 26 Aug 1300 to take pictures of faculty and staff.
The dept. received loss prevention money and a locked drop box was purchased to allow IAS forms and other documents to be dropped off for the dept. after hours.

8) ABET: All faculty need to review the ABET draft report. ABET draft report is due 1 Sept.

Minutes of May 17, 2010 ABET Meeting of the Mining Engineering program

In attendance: Walsh, Bandopadhyay, Chen and Ganguli

1. All agreed that since very students go to graduate school, it will be difficult to assess that educational objective. Therefore, the program educational objectives were modified to (the program outcomes each objective maps to, is listed in parenthesis):

To graduate competent engineers:

- who are prepared for employment in the mineral and energy industries (A-E, G,H,K)
- who are prepared to solve problems germane to Alaska, and (L)
- who are professionals and, therefore, stay technically current (F,I,J)

2. The performance indicators for various outcomes were discussed. As part of that, outcomes-course matrix was also examined. Faculty agreed to be outcome coordinators are follows:

A	Chen
B	Chen
C	Bandopadhyay
D	Ganguli
E	Walsh
F	Ganguli
G	Ganguli
H	Bandopadhyay

Bandopadhyay	C,H,J
Chen	A,B,L
Ganguli	D,F,G,I
Walsh	E,K

3. The proposed 2+2 program with Mongolian University of Science and Technology (MUST) was discussed. MUST students should be required to complete all MIN requirements here since ABET outcomes are assessed in MIN courses only.

Appendix L – Exit Interviews with Program Graduates

BS (Mining Engineering) Program
Exit Interview with Graduates
Name of interviewer/coordinator: ____Scott Huang_____ Date: May 6, 2011
Note to interviewer – Do not disclose/distribute interview record till final grades are posted.

1. The educational objectives of the program are given below. Are they appropriate? Do you wish to suggest any changes?
To graduate competent engineers who will be:

- ☐ employed in the mineral and energy industries
- ☐ solving problems germane to Alaska
- ☐ professional and understand the need to stay technically current

Are we preparing you to meet these objectives? If not, can you suggest ways we could?

Two main concerns regarding Mining PEO #2 and #3 were discussed during the interview. The students did not think the mining curriculum has systematically introduced them to the engineering problems related to Alaska. Although the related issues were mentioned in several of the mining classes, there were no in-depth discussions; specifically, the mining curriculum did not provide them with the technical information in arctic mining.
As to Mining PEO#3, the students considered that lecture notes of a few mining classes are antiquated. Information and technical specs of some of the mining equipments provided in those notes are no longer used in the industry. Their argument was that if a professor cannot demonstrate currency in his teaching, how can students understand the need to stay technically current?

2. The learning outcomes of the program are listed below. In a scale from 0 to 5, to what extent do you think you achieved the outcome? 0 implies ‘did not achieve’, while 5 implies ‘achieved to the highest level possible’

Table 3-1 The Mining Engineering Program Outcomes

Item	Outcomes	
A	An ability to apply knowledge of mathematics, science and engineering.	3 - 4
B	An ability to design and conduct experiments, as well as to analyze and interpret data.	3
C	An ability to design a system, component, or process to meet desired needs within realistic constrains such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.	3
D	An ability to function on multi-disciplinary teams.	N/A
E	An ability to identify, formulate, and solve engineering problems.	4
F	An understanding of professional and ethical responsibility.	1-2
G	An ability to communicate effectively.	5
H	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.	4
I	A recognition of the need for, and an ability to engage in life-long learning.	3
J	A knowledge of contemporary issues.	4
K	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	3-4
L	A knowledge of unique engineering and environmental issues in the arctic and subarctic regions.	1

Any comments on the previous question?
Student Outcome B: Not many mining classes provide students with the opportunity to conduct comprehensive design and experiment.
Student Outcome D: No opportunity to participate in multi-disciplinary teams in mining courses.
Student Outcome F: Topics mentioned in the senior design class, but not in depth.
Student Outcome L: Little to no focus on arctic mining. The topics should be incorporated into mining courses.
3. a) Did non-MIN courses in the curriculum (CORE/MATH/PHYS/CHEM/ES etc) help with FE exam?
All but the university core courses.
b) Specifically, did any of the MIN courses help with the FE exam?
The following courses help them with the FE exam;
MIN 408 in economics
MIN 409 in statistics
MIN 313 in mass balance flow sheet
MIN489 in ethics
4. Were the scholarships a factor in you staying in school, and especially in mining?
Yes, definitely.
5. Please provide input on your experience in the program/department. Consider the

following:

- ☐ Nature and quality of coursework
- ☐ Teaching quality
- ☐ Extracurricular activities (SME, Silver Fox, sponsorship to conferences, field trips etc)
- ☐ What worked and did not work
- ☐ Suggestions for improvement
- ☐ Any other

Among the above items, only teaching quality was discussed. In their opinion, some of the mining professors taught in generalities about the subjects rather than the details. However, they praised one of the professors highly for his technical knowledge and in-depth discussions of the subjects in his classes.

May 2010 – Exit Interview with one graduating senior

Dear MIN faculty members,

Upon Rajive's request, I had conducted the exit interview of the one mining engineering graduating senior on May 12, 2010. The following is my report on the interview.

1. I had requested the student to provide me with a number between 0 to 5 (5 being the highest) on how the student felt the program objectives have been met.

Objective 1 - 4.3
Objective 2 -
  Mine Exploration - 4.0
  Mine Development - 4.5
  Mine Exploitation - 5.0
  Mine Reclamation - 4.0

Objective 3 - 4.5

2. I had requested the student to provide me with a number between 0 to 5 (5 being the highest) on how the student felt the program outcomes have been met.

A - 5.0
B - 4.5
C - 4.5
D - 5.0
E - 5.0
F - 5.0

G - 4.0
H - 5.0
I - 5.0
J - 5.0
K - 5.0
L - 5.0

3. Some responses to other specific questions are as follows -

(i) Best thing took out of class - Vucan Design, Mine Plant Design
(ii) Any classes that need improvement - MIN 103, 104, and 106 (Redundant Material offered)
(iii) Any class that needs to be added to the program - Create a technical writing class within MIN program
(iv) Any class that should be dropped from the program - None
(v) Were all ES courses adequate? - Portions of some courses were not useful.
(vi) Any ES classes that needs to be dropped? - ES 201
(vii) Any ES classes that should be added? - None
(viii) Any MIN classes that need to be added? - None
(ix) Any faculty issues? - Low on faculty at times. Adjunct faculty such as Dr. Lin are doing a good job. No other issues.
(x) Any constructive criticism? - Liberal Arts stuff is useless, especially the class on Art Appreciation.

4. Overall, the student was very satisfied with the Mining Engineering program in UAF.

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May 4, 2009 –Exit Interview with 3 student

Exit Interview with Graduating Mining Seniors
Interviewed by Scott Huang
Three students came to the meeting with a marked mining curriculum sheet in hand. There were no leading questions from the interviewer.
The feedbacks from students are, in general, positive. Attentiveness and responsiveness of most mining faculty are the strength of the program. Excellent lab facilities and the Vulcan software training bring another high mark. The following summarizes what they discussed.
1. ES and GEOS Classes
• *ES201-Computer Techniques*: It would be more useful if the course offers training in Excel Macros, MS Project, AutoCAD, and Visual Basic Macros. A course such as “computer applications in mining engineering” will suffice.
• *ES307-Element of Electrical Engineering*: This issue is instructor-dependent. Two of the students considered that the component of power supply was not

taught or taught with very limited exposure.
• *GEOS 262- Rocks and Minerals*: The frequency of offering, which is the alternate Fall, has caused much difficulty in student's class scheduling. Although it was not a uniform problem among the students, it has delayed one student's graduation. The course focused more on rocks than minerals, and it created some disadvantages while taking GEOS 332-Ore Deposits and Structure.
2. Mining Classes
• *MIN 103-Introduction to Mining Engineering, MIN 104-Mining Safety and Operations Laboratory, MIN 106-Mining Operations I, and MIN 206-Mining Operations II* : The series of these four 1-credit classes has caused scheduling difficulty among students. These courses tend to take up the prime times in the workweeks. They suggested combining MIN 103 and MIN 104 as one 2-credit course, and MIN 106 and MIN 206 as another 2-credit course to ease the scheduling problems.
• *MIN 401-Mine Site Field Trip*: They felt that the course should be a 3-credit class for the amount of time involved. The extra one credit can be justified by additional training in technical writing.
3. Technical Electives
The list currently in the catalog is not up-to-date. They suggested adding geostatistics, AutoCAD, GIS, and internship, and delisting MIN 447-Placer Mining. Their contention of adding the internship course was based on the knowledge they obtained from summer internship and on-job training.
4. Facilities
• Lab facilities in the mining program are excellent, and their experiences have been very good, especially in the Vulcan training and rock mechanics. However, they suggested that if possible they would like to have more handson practices in surveying, explosives, and ventilation.
• Mineral preparation equipments need to be centralized in one building.
• Silver Fox Mine can be utilized by other mining classes (e.g., mine design classes) and incorporated in the Vulcan training.
5. Quality of Education
Most of the mining classes are very good, and they are prepared for the professional jobs. However, there was one concern regarding the style of teaching. It happened because of one particular instructor's outdated class notes and less earnest effort on homework grading.

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Date: May 5, 2008 and May 9, 2008
Number of students interviewed: 3
Interviewed by Margaret Darrow, Asst. Prof. of Geological Engineering

The Mining Engineering Program outcomes were given to our graduating seniors. They were asked to rate each of the 13 outcomes based on the level of significance expected and the level of skills acquired during their studies at UAF. The three students' responses have been summarized in the table below:

In order to ensure continuous quality improvement of the Mining Engineering program and asses the program for accreditation, the expected outcomes of the program must be defined, measured, and evaluated. Graduates of the program also are expected to demonstrate that they have mastered these skills.

Place a number from 1 to 5 to indicate, in your opinion, the level of significance of the following outcomes that you believe the program should provide, and what level of the skills you have acquired since attending UAF.

For Level of Significance Expected: 1 = minor significance, 3 = moderately significant, and 5 = extremely significant

For Level of Skills Acquired: 1 = unsatisfactory, 3 = average, 5 = exceptional mastery of skill or subject matter

	Outcomes/Skills	**Level of Significance Expected**	**Level of Skills Acquired**
1	An ability to apply knowledge of mathematics, science and engineering	4.7	4.7
2	An ability to design and conduct experiments, as well as to analyze and interpret data	4.0	4.0
3	An ability to design a system, component, or process to meet desired needs within realistic constraints, such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	4.7	4.7
4	An ability to function on multi-disciplinary teams	3.3	3.3
5	An ability to identify, formulate, and solve engineering problems	5.0	4.7
6	An understanding of professional and ethical responsibility	4.3	4.7
7	An ability to communicate effectively	4.3	3.7
8	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	4.7	4.3
9	A recognition of the need for, and an ability to engage in life-long learning	3.3	3.3
10	A knowledge of contemporary issues	4.7	4.3
11	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	4.7	4.3
12	A knowledge of engineering for arctic and subarctic conditions	4.0	4.3
13	A knowledge of unique environmental issues in the arctic and subarctic regions	4.0	4.3

The following summarizes the discussion between the faculty and the students, and includes the students' suggestions.

Outcome 1: The students felt that this objective was adequately met.

Outcome 2: Two of the three students felt that they had good experience analyzing the results of experiments, but they felt that they did not learn how to design an experiment. All experiments were provided for them pre-made. They would have like to have started from scratch with the identification of a problem for which to design an experiment.

Outcome 3: Two students felt that this objective was addressed in almost every class, and covered well. The third student felt that the Senior Design class to which this objective

completely applies. This student felt that all the lower mining courses covered subjects broadly, but the Senior Design course was designed to require a detailed analysis. In this student's opinion, this represents a disconnect in the overall mining engineering curriculum.

Outcome 4: Two students felt that they had no experience working with other disciplines. They have worked on a lot of team projects, but the other students involved were always mining students. The third student felt that there was adequate multi-disciplinary team work.

Outcome 5: All students felt that this objective was heavily emphasized in every class, since each class dealt with real-life problems. Two students would have liked, however, more emphasis on hard rock mining.

Outcome 6: The students felt that ethics was covered in the environmental class and in the design courses.

Outcome 7: This objective was adequately met. However, one student felt that there should be more detailed critique of the students' presentations. Also, the core communication courses did not align well with engineering. The students should be taught how to do a technical presentation.
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Outcome 8: They felt that this was addressed, with the humanities using industry-related topics.

Outcome 9: Two students felt that they have to be life-long learners to keep up with industry. One student felt that this outcome was poorly represented, and suggested that keeping course content up-to-date would provide a better example of this outcome.

Outcome 10: One student felt that the mining courses did an average job at addressing this outcome, and should improve. The other students felt that there was a great deal of emphasis placed on contemporary issues throughout their education.

Outcome 11: The students felt that in some areas they had great experience in the most up-to-date tools and software. The areas where improvements could be made are to update the economic software and cost estimations, and the university library needs to have more up-to-date texts on various mining subjects.

Outcome 12: The students felt that this was addressed as the last week of every course. It was suggested that since not all students will stay in Alaska, this information was sometimes superfluous, and represented a waste of time as it was presented. One students suggested that an alternative would be to develop an arctic mining engineering course to be offered as an elective. That way, the students who are staying in the arctic regions could hone their skills, without bogging down every class with this information. In addition to this, it was suggested that not all the faculty may have arctic engineering background, so having one individual who is trained in this area teach arctic mining engineering would be to everyone's advantage.

Outcome 13: Similar comments to Outcome 10.

Other comments:

7. The students were happy to see faculty with professional experience, since it provides them with a more industry-related degree.

1) If they could, the students would change ES201. They would drop the current programming languages, and instead would like to see Excel taught, with an emphasis on macros. Additionally, they felt that a quick overview of the MS Office software would help a great deal in the early part of their education. Another suggestion was to teach the most up-to-date programming language, whatever that may currently be.

2) The students felt that the Mine Surveying class could easily be combined with the Civil Engineering surveying class.

3) Two students felt that the most applicable course was MIN104, as it served as a foundation for everything that was to come. The third student felt that the overview mining methods course was very good, but that the series of mining methods courses tended to have repetitive content.

4) The students strongly felt that there needs to be greater emphasis on hard rock mining. For example, the underground mining methods course should be split half and half between coal mining and hard rock mining. They felt that they learned the hard rock mining portion solely from internships and the SME handbooks.

5) The students enjoyed the discussion about faculty research in classes, since it is interesting and relevant. They noted that the faculty were always available and helped as much as possible. They were concerned about some faculty using the same teaching notes for many years.

6) The students suggested replacing one of the English core classes with a technical writing class.

7) It was suggested that the FE exam needs to have mining and geological engineering content added.

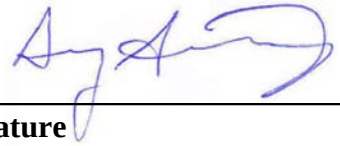
8) One student suggested that because the department is so small, the faculty need to be dedicated to the department classes and should not be required to teach ES classes. It appears that some elective classes were canceled because there was not sufficient faculty to teach; however, faculty were still teaching ES classes. The student felt that the larger engineering departments should take more of the ES teaching load.

Signature Attesting to Compliance

By signing below, I attest to the following:

That the **B.S. Mining Engineering Program** has conducted an honest assessment of compliance and has provided a complete and accurate disclosure of timely information regarding compliance with ABET's *Criteria for Accrediting Engineering Programs* to include the General Criteria and any applicable Program Criteria, and the ABET *Accreditation Policy and Procedure Manual.*

Douglas J. Goering
Dean's Name (As indicated on the RFE)



Signature **Date** **June 24, 2011**