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BACKGROUND INFORMATION

A. Contact Information

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B. Program History

The Geological Engineering (GE) bachelor of science program at the University of Alaska Fairbanks (UAF) was initially accredited by ABET in 1941. In the 1970s, the GE program joined the Mining Engineering program to become the Department of Mining and Geological Engineering. The GE program at UAF is the only academic program in the U.S. that offers a baccalaureate degree in geological engineering with an emphasis on arctic and subarctic regions. Over the years, graduates of the program have been instrumental in development of Alaska’s mineral resources, infrastructure, and civil construction projects. In the past three decades, many of our graduates have developed their careers outside the mineral industry, securing employment in oil and gas, geotechnical, and construction industries and in governmental agencies. Through the years, our graduates have demonstrated leadership skills as managers and administrators in major corporations and state and federal governments.

The GE program contributes to the strategic pathways and goals of the UAF Strategic Plan 2010 in three integral components (i.e., instruction, research, and services) of an academic institute. Faculty of the GE program strive for success by refining measurable program learning standards and competencies; increasing opportunities for students and student participation in experimental learning through research and summer internships; and strengthening community engagement by focusing their research efforts on economic development activities in Alaska (e.g., railroad extension, gas pipeline, and cut slope improvement along state roadways). The GE program serves as a resource for state and private development through consulting and research, and trains professionals for employment in Alaska and elsewhere.

The UAF baccalaureate program in geological engineering is designed to produce competent, well-rounded engineers. The first two years of study provide basic communication skills, social, and engineering skills in preparation for students’ more-advanced education. The final two years provide students with the engineering skills necessary to become competent practicing engineers. The skills developed over the course of the program are applied and demonstrated through senior design projects, and sometimes through internships and summer jobs.
In order to meet the challenges of the twenty-first century, the GE program has undergone several significant changes since the ABET’s last visit in 2005. The GE Program Educational Objectives (PEOs) have been modified to reflect the career and professional accomplishments of our graduates in recent decades. In addition, the GE program has modified the prerequisites requirements for GE 480 – Senior Design, and now requires students to complete all of the GE core courses including summer field courses (GE 381 and GE 382) before taking the senior design course. In so doing, the offering frequency of the summer field courses has changed.

In the area of faculty resource and personnel, the GE program hired a junior faculty member, Dr. Margaret M. Darrow, at the assistant professor rank in late January 2008 to replace Dr. Wendy Zhou, an associate professor, who left UAF in mid-January 2008. Both professors have similar academic backgrounds, and the impact of this transition to the program curriculum was negligible. One of the senior faculty members in the program, Dr. Paul Metz, has bought out his teaching since 2009. By reallocating his teaching load to the remaining three GE faculty—one mining professor and one adjunct professor—the program has managed to fulfill its educational obligation with minimal interruption.

Student enrollment in the program has increased an average of 20% annually over the last five years. The increase has been especially noticeable since 2008, with implementation of the 2+2 program with the China University of Petroleum Beijing (CUPB).

Options

The GE program DOES NOT have any options.

C. Organizational Structure

The University of Alaska Fairbanks, 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 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 in size than colleges. 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 the end of this section for a broad organizational layout.

The College of Engineering and Mines (CEM) 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, 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,
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 and post-doctoral research.

The Program
The GE program, consisting of four faculty members—Margaret M. Darrow, Scott Huang, Paul Metz, and Debasmita Misra—resides with the Mining Engineering program in one academic department (see GE program organization chart within CEM below). Although the GE program and Mining Engineering program share one departmental office, staffed by one Office Manager, who is supervised by the department chair (current chair: Rajive Ganguli), the Department of Mining and Geological Engineering is organized in such a way that each program functions as an autonomous unit.
GE program organization chart within CEM.
D. Program Delivery Modes
The GE program offers traditional lecture/laboratory instruction to students. Most course offerings are during normal lecture hours from 8:00 A.M. to 5:10 P.M. The required field courses (GE 381 and GE 382) are offered in the summer months, with about ten hours of fieldwork each day, seven days a week for six weeks.

E. Program Locations
The GE program is a residence educational program, with all courses offered on the main campus (Fairbanks).

F. Deficiencies, Weaknesses or Concerns from Previous Evaluation(s) and the Actions Taken to Address Them
The Engineering Accreditation Commission (EAC) of ABET, Inc. reviewed an interim report submitted by the GE program for the 2005–06 accreditation cycle and a follow-up program audit for 2007–08, and has approved the action plan put forth by the program. The summary of the EAC Interim Evaluation stated that \textit{the weakness at the program level has been resolved}.

G. Joint Accreditation
None
GENERAL CRITERIA

CRITERION 1. STUDENTS

A. Student Admissions
There are three pathways for a student to be admitted to the Geological Engineering BS program. The requirements are:

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, the student must meet freshman 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 Geological Engineering faculty member and the Chair of the Department of Mining and Geological Engineering. Students in a two-year program cannot change their major into a four-year degree program; they have to apply for admission into the program.

A student who does not meet these requirements is placed in a “Pre-major” sub-group of geological 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 Chair of the Department of Mining and Geological Engineering.

B. Evaluating Student Performance
UAF requires early grade reports for all freshman students at the end of six weeks of the semester. These grades are reported to students on their UAOnline account. The goal is to give freshman 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 well, 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 early grades below the passing mark.

To remain in good academic standing, UAF requires undergraduate students to 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 academic 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. This online system is in addition to UAOnline, which allows students to view their transcripts online.

### 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

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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, 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 in the catalog on page 37. UAF is a member of the Servicemembers Opportunity Colleges (SOC) network. For additional information about the SOC program, please 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 are considered to 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 or GE faculty 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 1-to-1 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.

The 2+2 students from the China University of Petroleum Beijing (CUPB) are considered transfer students. These students are admitted to the GE program based on their satisfactory academic performance at CUPB and their having met UAF’s TOEFL requirements. The transfer equivalency of courses including university core courses, geological engineering, and geosciences is evaluated by the Registrar’s Office with assistance from GE faculty. Per the Memorandum of Agreement between UAF and CUPB, total transfer credits should not exceed
50% of the minimum required credits for the GE baccalaureate degree. Exchange students from CUPB must fulfill the UAF graduation and residency requirements.

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 departments. 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 prevention 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.

Every geological engineering student is assigned a GE faculty member as an advisor, though depending on his/her admission pathway, the student may see the CEM Academic Advisor for a semester or two before declaring the major. Note that the CEM Academic Advisor has been instructed to direct all students with an interest in geological engineering to see a GE 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 an advisor in GE is unavailable. To improve advising across campus, the AAC now only sees undeclared majors. Therefore, unless a student is not officially a Geological Engineering major, it is nearly impossible not to see a GE faculty advisor. The GE program has an open-door policy, and faculty are responsive to student requests for advising. Students rarely ever need to seek advice outside the program.

Advising sessions cover not only course registration advice, but also career and non-curricular professional matters (such as participation in the AEG Student Chapter and attendance at the AEG annual meeting, internships, summer employment, and internal and external scholarships). Faculty also help connect employers to graduating seniors. 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 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 test 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**

Three months before graduation, a student must apply for graduation with the Graduation Office of the Office of Admissions and the Registrar. Early in their fourth year of study, GE senior students are advised to conduct an informal degree-requirement check through DegreeWorks©. A student working toward a bachelor’s degree may graduate under the catalog in effect in any year in which he/she is enrolled as a degree-seeking student, provided the catalog is not older than seven years. The Graduation Office conducts a formal degree audit to assure that graduating seniors meet all the requirements for graduation, and notifies the student and faculty advisor of the status of course requirements. The academic advisor then acts on any questions the Registrar’s Office might have concerning how a student has met the graduation requirements and initiates approvals of technical electives and petitions, if not yet completed.

The GE degree-requirement audit sheet is shown below.

**G. Transcripts of Recent Graduates**

The GE program will provide the reviewer with transcripts from some of the most recent graduates, along with any needed explanation of how the transcripts are to be interpreted.

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GE degree requirement audit sheet  
**2010-11 CATALOG**  
**GEOLOGICAL ENGINEERING**  
B.S. Degree Requirements  
134 Credits  

**GENERAL REQUIREMENTS**

**COMMUNICATIONS:**- (9)  
Engl 111X (3)  
Engl 211X or 213X (3)  
Comm 131X or 141X (3)  

**PERSPECTIVES ON THE HUMAN CONDITION:- (18-22)**  
*Complete the 6 courses listed OR 4 of those listed plus 2 semester length courses in a single AK Native or other non-English language or 3 semester length courses (9 credits) in American Sign Language.*  
Anh 100X/Soc 100X (3)  
Econ/PS 100X (3)  
Hist 100X (3)  
Art/Mus/Thr 200X or Hum 201X or ANS 202X (3)  
Engl/FL 200X (3)  
BA 323X or Comm 300X or Just 300X or Nrm 303X or Phil 322X or PS 300X (3)  
Language option as listed above:  
_______( )_______( )_______( )_______( )_______( )_______( )

**MATHEMATICS:- (18)**  
Math 200X (4)  
Math 201X (4)  
Math 202X (4)  
Math 302 (3)  
STAT 200 (3)  

**NATURAL SCIENCE:- (16)**  
Chem 105X (4)  
Chem 106X (4)  
Phys 211X (4)  
Phys 212X (4)  

**LIBRARY & INFO SKILLS:- (1)**  
101X (1)

**UPPER DIVISION CREDITS:- (39)**  
Transfer Credits  
UAF Credits (24)*  
TOTAL TO DATE:  
TO BE COMPLETED:  
*a minimum of 24 UAF credits

**COMPLETE 2 DESIGNATED (W) COURSES AND 1 DESIGNATED (O) COURSE OR 2 COURSES DESIGNATED (O/2) AT THE UPPER DIVISION LEVEL:**  
_______(W)_______(W)  
_______(O) OR ______(O/2)______(O/2)

*Designates only grades of "C" or better may be used to fulfill this requirement.

**MAJOR REQUIREMENTS**

**A. Complete the following:- (52)**  
G.E. 101 (1)  
G.E. 261 (3)  
G.E. 365 (3)  
G.E. 375 (3)  
G.E. 381 (2)(W)  
G.E. 382 (4)(W)  
G.E. 405 (3)  
G.E. 420 (3)  
G.E. 471 (3)  
G.E. 480 (3)(W)  
Geos 213 (4)  
Geos 214 (4)  
Geos 322 (4)  
Geos 332 (3)  
Min 202 (3)  
Min 370 (3)  
Min 408 (3)  

**B. Complete 6 credits of approved Technical elective**  
________(3)________(3)

**C. Complete the following Engineering Science courses:- (14)**  
E.S. 201 (3)  
E.S. 208 (4)  
E.S. 331 (3)  
E.S. 341 (4)

**D. Must take the Fundamentals Of Engineering Exam.**  
EXAM TAKEN:__________

Must earn 'C' grades or better in A, B and C LS areas.

Credits for core/general requirements:  62  
Credits required for major:  72  
Total credits required for degree:  134
CRITERION 2. PROGRAM EDUCATIONAL OBJECTIVES

A. Mission Statement

The University of Alaska Board of Regents approved UAF’s latest mission statement at its June 8, 2006, meeting. The following statement is now contained in UA Board of Regents Policy 10.01.03 and posted at http://www.uaf.edu/uaf/about/mission.html:

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.

The mission statement of the College of Engineering and Mines is:

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.

The mission statement of the GE program also is shown on its web page http://www.alaska.edu/uaf/cem/ge/ and the UAF catalog:

To advance and disseminate knowledge related to mineral and energy exploration, evaluation, development and production; engineering site selection, construction and construction material production; and groundwater and geo-environmental engineering including geologic hazards assessment, through creative teaching, research and public service with an emphasis on Alaska, the North and its diverse peoples.

B. Program Educational Objectives

Since the last ABET visit in 2005, and in order to meet the challenges of the twenty-first century, the GE program has undergone several major changes including new program educational objectives (PEOs), revised student outcomes, improved assessment methods, course modifications and laboratory modernization, and new faculty hire. The latest GE PEOs are shown on the GE web page at http://www.alaska.edu/uaf/cem/ge/ and in the UAF catalog:

- Graduates will be employed in one of the following professional areas: mineral and energy exploration and development; geotechnical engineering; groundwater engineering; or geo-environmental engineering.
- Graduates will possess technical knowledge required to meet the unique challenges of geological engineering problems germane to cold regions, especially Alaska.
• Graduates will pursue life-long learning through continuing education opportunities, professional registration/certification, and/or graduate studies.

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

The GE program contributes to the strategic pathways and goals of the UAF Strategic Plan and its educational mission in three integral components (i.e., instruction, research, and service) of an academic institute. Faculty of the GE program strive for success by refining measurable program learning standards and competencies; increasing student participation and opportunities in experimental learning through research and summer internships; and strengthening community engagement by focusing their research efforts on economic development activities in Alaska (e.g., railroad extension, gas pipeline, and cut slope improvement along state roadways). The GE program serves as a resource for state and private development through consulting and research, and educates students for employment in Alaska and elsewhere.

The philosophy used when crafting each of the GE PEOs to conform to the mission of UAF is elaborated below:

Objective 1: Graduates will be employed in one of the following professional areas: mineral and energy exploration and development; geotechnical engineering; groundwater engineering; or geo-environmental engineering.

The emphasis of this PEO is to provide GE students with a well-balanced education in the areas of typical activities that challenge geological engineers in Alaska. In so doing, our graduates will be able to compete with other professionals with a similar educational background during their initial employment periods of three to five years. The belief of the faculty and our industrial partners is that career paths can change from one focus sector to another because of resource and infrastructure developments in the State of Alaska and because of development in the global economy. Therefore, a student needs to be prepared for when this change occurs. For example, mineral resource development in the 1970s and 1980s provided employment opportunities for our graduates in mineral and energy exploration and development. However, in the late 1990s and early 2000s, almost half of our graduates worked for geotechnical firms and state agencies. Future construction of the Alaska gas pipeline and extension of the Alaska Railroad will likely provide ample job opportunities in geological/geotechnical, geo-environmental, and construction engineering. GE faculty advise their students with a forward-looking vision and prepare them to be skillful in one of the four employment areas that will have high growth potential in Alaska. Through faculty research, classroom and laboratory training, and summer internships, GE students develop a fundamental understanding of real issues facing industries in Alaska. The combination of lectures, internships, and research often gives our graduates an edge over other engineers coming from the Lower 48.

Objective 2: Graduates will possess technical knowledge required to meet the unique challenges of geological engineering problems germane to cold regions, especially Alaska.

Alaska has unique engineering problems caused by extreme weather conditions and permafrost. Geological engineering is a dynamic discipline, with new challenges occurring constantly. Practicing engineers in Alaska must attain a certain level of readiness in order to solve
problems germane to Alaska and its frigid environment. The GE program’s second PEO is to provide students graduating from our program with the knowledge required to meet these challenges. The program prepares students to understand the problems by having them participate in professional activities and attend seminars, society meetings, and formal lectures. Arctic engineering and permafrost science are an integral part of our curriculum. Case studies, homework assignments, class lectures and laboratory exercises, and term projects embedded in most GE courses provide our students with intensive, specialized training in arctic science and engineering. Student skills are further enhanced with internships and summer employment in industry and government. With these exposures, our students become familiar with Alaska’s evolving engineering challenges and are ready to face professional tests upon their graduation.

Objective 3: Graduates will pursue life-long learning through continuing education opportunities, professional registration/certification, and/or graduate studies.

In recent years, almost half of the GE program’s graduates chose to continue graduate study at UAF or other institutions full time or to attend graduate school part time while working for consulting firms or government agencies. GE faculty recognize this trend and feel that it is imperative that our graduates understand the importance of life-long learning and are prepared for advanced study and career development in professional life. In many of the GE courses, the importance of maintaining the currency of technical knowledge is emphasized through class lectures and projects. GE faculty often communicate with recent graduates via email and phone calls, encouraging them to further their knowledge and credentials by attending workshop training, taking university courses and/or degrees necessary for career development, and passing the PE and other certification exams.

D. Program Constituencies

The constituents of the GE program include:

- **Geological Engineering students:** These are the current full-time and part-time students bound by shared educational goals and loyalty. Because of its size, the GE program is a close-knit family. With their strong motivation for learning, students of the GE program constitute one of the program’s most valuable assets. In recent years, more than half of GE students have been traditional students from communities in Alaska. Several of these students have dual majors in geological engineering as well as geology, civil engineering, or other disciplines. Our students join student societies (e.g., AEG, SME, and SWE) and professional societies (e.g., AEG and AMA), and participate in many professional activities through volunteer work, meetings, and presentations. Many GE students work part time during school as interns with government agencies or as student assistants on campus, and full time during summers for companies and governments.

- **Employers of GE graduates:** These are companies in the mineral, oil and gas, and consulting industries, and government agencies at the state and federal level that either have hired graduates of the GE program or have the potential to hire them. Employers offer job opportunities to graduates of the GE program, with the knowledge that its students have received quality education and are prepared to face engineering challenges related to cold regions. The GE program maintains good working relationships with many firms and agencies in Alaska.
• Alumni of the GE program: These are graduates of the program. The Department of Mining and Geological Engineering maintains a database that lists the status of our graduates, including their contact information, employment, and position titles, if possible. Alumni are often invited by the AEG Student Chapter to give presentations during its bi-weekly meetings. Several of the alumni also serve on the GE Advisory Board. The UAF Alumni Association is an active network of graduates and former students who support the university and advocate on its behalf. CEM has an annual banquet in April, and alumni of the college, including GE graduates, are invited to attend.

• Friends of the GE program: These are individuals and companies who support the program. Because of its long history in Alaska and because of our good working relationship with industries and agencies, the GE program enjoys strong support from them including donations, suggestions, and employment opportunities for our graduates.

E. Process for Revision of the Program Educational Objectives

Beginning in December 2000, the GE program initiated a process to develop and improve program curriculum, outcomes, and educational objectives. This task involved informing our constituents of the ABET accreditation criteria; conducting surveys and reviewing and analyzing survey results; assessing the efficacy of the courses and program outcomes to meet its educational objectives and mission; and implementing program curriculum changes, if needed. This process repeats every three to five years. The outcome assessment in the first 5-year cycle (i.e., 2000–2005) resulted in the implementation of several actions designed to improve GE student outcomes.

After the latest ABET visit in 2005, the GE program, through the closing-the-loop process, implemented student outcomes revision, improvements in assessment methods, curricular and course changes, rearrangement of faculty teaching assignments, and more, which led to two revisions of the GE PEOs. The interim PEOs, which were approved in early 2010, were further modified in October 2010, and resulted in the current set of PEOs that are consistent with the new ABET criteria.

Comparisons between the 2005 version of the GE PEOs and the interim and the current versions are as follows:


• To graduate students who are competent engineers and who are prepared for employment in one of the following professional areas: mineral and energy exploration, evaluation, development, production; geotechnical engineering; groundwater engineering; and geo-environmental engineering.

• To graduate students who are competent engineers and are prepared to solve problems germane to Alaska, the North, and its diverse peoples.

• To graduate students who are competent engineers and 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 Alaska; and who are engaged in public service to enhance the lives of the diverse peoples of the North.

The interim GE Program Educational Objectives (early 2010–late 2010):

- Graduates are prepared for employment in one of the following professional areas: mineral and energy exploration and development; geotechnical engineering; groundwater engineering; or geo-environmental engineering.
- Graduates are prepared to meet the unique challenges of geological engineering problems germane to cold regions, especially Alaska.
- Graduates are prepared for graduate studies and the pursuit of life-long learning.

The current GE Program Educational Objectives (late 2010–present):

- Graduates will be employed in one of the following professional areas: mineral and energy exploration and development; geotechnical engineering; groundwater engineering; or geo-environmental engineering.
- Graduates will possess technical knowledge required to meet the unique challenges of geological engineering problems germane to cold regions, especially Alaska.
- Graduates will pursue life-long learning through continuing education opportunities, professional registration/certification, and/or graduate studies.

The GE PEOs are reviewed periodically, the latest revision having been completed in late 2010. The review process involves three groups of individuals: the faculty members in the program, the advisory board, and the students. The GE faculty are usually the first group to initiate changes of courses, curriculum, student outcomes, and/or educational objectives through outcomes assessment. As the assessment leads to modification of the PEOs, the faculty seek suggestions from the advisory board members. The GE Advisory Board is an independent body of professional community leaders, alumni, and other interested members representing our various constituencies. The advisory board plays an important public relations role and provides GE faculty with a fresh perspective on program issues. With input from the advisory board, the PEOs are then reviewed by graduating seniors during the exit interview, by recent graduates in industry, government agencies, and graduate schools, and by employers.

The following steps summarize the main activities after the 2005 ABET visit:

- In 2007, GE faculty initiated removal of the fourth objective related to the academic duties of faculty, inasmuch as the program’s constituents do not include GE faculty.
- In consultation with the GE Advisory Board during a meeting in 2008 (see the GE Program Evaluation by Frank Wuttig, Shannon & Wilson, Inc.) and after subsequent communication in 2009–10, and in view of new faculty hire in January 2008, the first educational objective of the GE program was modified to reflect the expertise of current faculty members and the professional areas in which our graduates seek employment. The language of the second and third educational objectives was revised slightly in the process.
• In the process of revising the PEOs, the advisory board suggested that the term “cold regions” be used in lieu of “the North.” The argument for this change in terminology was that the GE curriculum at UAF focuses on geological engineering education in cold regions, which encompasses a much larger area than the northern region.

• Life-long learning promotes the currency of knowledge and competence of our graduates throughout their careers, to say the least. In order to emphasize this idea, GE faculty and the advisory board broadened the third educational objective to include not only advanced studies in colleges but also the acquiring and updating of various abilities, interests, knowledge, and qualifications. The statement “the pursuit of life-long learning” was thus added.

• In June 2010, a survey of student outcomes and the interim educational objectives was sent to students who had graduated within the last two years (see survey questionnaire, Example Alumni Survey Form – June 2010 and the results).

• In October 2010, the interim PEOs were modified to bring them in line with the new ABET criteria. Students and members of the GE Advisory Board were informed of the proposed changes, and their suggestions and approval led to the current version of the PEOs.

• In February 2011, online employers and alumni surveys were conducted to assess how successful the new GE PEOs have been (see survey questionnaires, Example of the Alumni Survey Form – February 2011 and Example of the Employers Survey Form – February 2011, and the survey results). The target group of our alumni was those students who had graduated from the GE program in the last five years. The survey data will be incorporated in the next cycle of self-assessment of the GE program.

During the course of revising the PEOs, the GE faculty and the advisory board adopted a formal process that will allow systematic and periodic review and modification of the educational objectives in the future. The process, which was approved in late 2010, is summarized below:

• The GE faculty initiate review of the student outcomes assessment, conduct alumni and employer surveys, and propose changes to the PEOs;

• The revised PEOs are forwarded to the advisory board members for review and suggestions;

• Suggestions from the advisory board members are incorporated and reviewed by GE student representatives;

• The final PEOs are resubmitted to the advisory board for approval; and

• The approved PEOs are posted in the UAF catalog and the online catalog, and on the GE website.
March 18, 2008

Dept. of Mining and Geological Eng.
University of Alaska Fairbanks
Fairbanks, Alaska

Attn: Gang Chen, Ph.D., P.E.

RE: EVALUATION OF THE GEOLOGICAL ENGINEERING PROGRAM

I have a B.S. degree from the University of Missouri Rolla (UMR) and an M.S. degree from the University of Alaska Fairbanks (UAF), both in Geological Engineering. I graduated from UAF with an emphasis in cold regions engineering in 1988. Since 1991, I have been working as a geotechnical engineer with Shannon & Wilson in Fairbanks. My evaluation of the geological engineering program at UAF is based on my experience as a graduate student in the mid-1980s at UAF and on observations of applicants we have interviewed or hired from the program. My perspective is therefore one of a practicing geotechnical engineer with an M.S. rather than a B.S from UAF.

It has been our general experience that graduates from the geological engineering program at UAF have the potential to make excellent geotechnical engineers due to their appreciation and understanding of geology in addition to their engineering training.

We expect geological engineers with a B.S. in Geological Engineering (G.E.) from UAF (no matter what their emphasis or specialty) to have an education in the fundamentals of geology and geophysics, and strong skills in the engineering of earth materials, including soils, rock, and fluids. And, since a large portion of a geological engineer’s work consists of report writing, strong technical writing and communication skills are critical. We have seen that some of the graduates from the program have been weak in some engineering and writing skills. We suggest offering a technical writing course within the College of Engineering and Mines to all engineers at the university.

Although the Geological Engineering at UAF is similar to other programs across the country, it has been my experience that the quality of a program and the student’s educational experience
depends on individual instructors, as well as the motivation of the student. The quality of the program at UAF has varied depending on the composition of the faculty. It is extremely important to recruit and retain quality faculty to maintain a viable program that will also attract quality students.

One of the stated missions of the geological engineering program is to teach with an emphasis on Alaska, the North, and its diverse people. We therefore expect that a G.E. curriculum requirement at UAF would be a course in permafrost or permafrost engineering.

We find some of geological engineering applicants have stronger skills in economic geology than in engineering. We suggest modifying the curriculum to replace requirements for coursework in ore deposits with more fundamental courses in structural geology and engineering, and offering the economic geology courses as electives.

If you have any questions or comments regarding my evaluation of the Geological Engineering program at UAF, please do not hesitate to call.

Sincerely,

SHANNON & WILSON, INC.

Frank Wuttig
Associate
I. The following three questions relate to the current Geological Engineering B.S. Program Educational Objectives. In your opinion, the GE program has:

a) Prepared you for employment in one of the following professional areas: mineral and energy exploration and development; geotechnical engineering; groundwater engineering; or geo-environmental engineering.

- [ ] Strongly Disagree
- [ ] Disagree
- [ ] Undecided
- [ ] Agree
- [ ] Strongly Agree

b) Prepared you to meet the unique challenges of geological engineering problems germane to cold regions, especially Alaska.

- [ ] Strongly Disagree
- [ ] Disagree
- [ ] Undecided
- [ ] Agree
- [ ] Strongly Agree

c) Prepared you for graduate studies and the pursuit of life-long learning.

- [ ] Strongly Disagree
- [ ] Disagree
- [ ] Undecided
- [ ] Agree
- [ ] Strongly Agree
II. The following matrix presents the GE program outcomes by which the Educational Objectives mentioned above will be met. In your opinion, the GE program has provided you with:

<table>
<thead>
<tr>
<th>Program Outcomes</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Undecided</th>
<th>Agree</th>
<th>Strongly Agree</th>
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<tbody>
<tr>
<td>An ability to apply knowledge of mathematics, science and engineering</td>
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<td>An ability to design and conduct experiments, as well as to analyze and interpret data</td>
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<td>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</td>
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<td>An ability to function on multi-disciplinary teams</td>
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<td>An ability to identify, formulate, and solve engineering problems</td>
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<td>An understanding of professional and ethical responsibility</td>
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<td>An ability to communicate effectively</td>
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<td>The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context</td>
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<td>A recognition of the need for, and an ability to engage in, life-long learning</td>
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<td>A knowledge of contemporary issues</td>
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<tr>
<td>An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice</td>
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<tr>
<td>A knowledge of engineering applications as related to geological resources and geohazards in Alaska and an ability to practice engineering in arctic-related projects</td>
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</table>

Please mail the completed survey form to Scott Huang at slhuang@alaska.edu or the address below:
Scott Huang, ABET Coordinator for GE Program
Department of Mining and Geological Engineering
University of Alaska Fairbanks
PO Box 755800
Fairbanks, AK 99775-5800
Alumni survey results from graduates in 2009 and 2010 (Rating: strongly disagree = 1 and strongly agree = 5; Survey date: June 2010; Number of responses: 3).
February 10, 2011

Dear Alumni:

Faculties from UAF’s Geological Engineering (GE) Program earnestly request your help in preparation for the upcoming program accreditation review in 2011. This review, conducted by the Accreditation Board for Engineering and Technology (ABET) every three to six years, is extremely important to our program, and your input can make a significant difference.

We sincerely request that you take a few minutes out of your busy schedule to fill out the survey. The survey will provide valuable information to evaluate the GE program and to help us improve and contemporize the curriculum. It also will serve as a key component for the ABET review.

With your help, we are optimistic that we will have a successful ABET review, and that our program will grow and continue to play an important role in serving the professional community and the public.

We would appreciate it if you would take the time to complete this short online survey by clicking on the following link:

http://www.surveymonkey.com/s/VHPKQZ2

The survey will take about 2 minutes to complete. Your responses are anonymous and will be kept strictly confidential.

Sincerely yours,

Scott Huang, ABET Coordinator for GE Program
Geological Engineering Alumni Survey Form

How many years have passed since you graduated from UAF with BS degree in Geological Engineering?

- ≤ 1 year
- 1 ~ 2 years
- 2 ~ 3 years
- 3 ~ 5 years
- ≥ 5 years

What is your major field of employment?

- Mineral and Energy Exploration and Development
- Geotechnical Engineering
- Groundwater Engineering
- Geoenvironmental Engineering
- Other (including graduate study)

Have you had continuing education such as attending a workshop/conference, taking college courses, or pursuing an advanced degree for professional enrichment since you graduated from the Geological Engineering program at UAF?

- Yes
- No

In general, how would you rate the technical knowledge and skills you have acquired from the Geological Engineering program at UAF to work on Alaska-related projects?

- Excellent
- Very Good
- Fair
- Poor

Are you a registered professional engineer or a certified geologist?

- Yes
- No

How would you rate the importance of ethical and professional responsibilities to your job/study?

- Very Important
- Fairly Important
- Important
- Not Important
- Unable to Rate
The Geological Engineering program has identified the following three forward-looking educational objectives and established an assessment process to assure the objectives are met successfully.

- Graduates will be employed in one of the following professional areas: mineral and energy exploration and development; geotechnical engineering; groundwater engineering; or geo-environmental engineering.
- Graduates will possess technical knowledge required to meet the unique challenges of geological engineering problems germane to cold regions, especially Alaska.
- Graduates will pursue life-long learning through continuing education opportunities, professional registration/certification, and/or graduate studies.

In your opinion, how successful is the UAF Geological Engineering program in accomplishing its educational objectives?

- Excellent
- Very Good
- Fair
- Poor
- Unable to Rate
February 10, 2011

Dear Employer:

Faculties from UAF’s Geological Engineering (GE) Program earnestly request your help in preparation for the upcoming program accreditation review in 2011. This review, conducted by the Accreditation Board for Engineering and Technology (ABET) every three to six years, is extremely important to our program, and your input can make a significant difference.

We sincerely request that you take a few minutes out of your busy schedule to fill out the survey. The survey will provide valuable information to evaluate the GE program and to help us improve and contemporize the curriculum. It also will serve as a key component for the ABET review.

With your help, we are optimistic that we will have a successful ABET review, and that our program will grow and continue to play an important role in serving the professional community and the public.

We would appreciate it if you would take the time to complete this short online survey by clicking on the following link:

http://www.surveymonkey.com/s/VBQVSS3

The survey will take about 2 minutes to complete. Your response is anonymous and will be kept strictly confidential.

Sincerely yours,

Scott Huang, ABET Coordinator for GE Program
Geological Engineering Employer Survey Form

What is your company’s major field of professional services?
- Mineral and Energy Exploration and Development
- Geotechnical Engineering
- Groundwater Engineering
- Geoenvironmental Engineering
- Government
- Other

Where is your main business location?
- Alaska
- Contiguous United States or Hawaii
- Foreign Country

How many graduates of the Geological Engineering B.S. program at the University of Alaska Fairbanks your company has hired in the past 5 years?
- 1 ~ 2 employees
- 2 ~ 5 employees
- 5 ~ 10 employees
- ≥ 10 employees

In general, how would you describe the opportunities offered by your firm to employees for their continuing education such as attending workshop/conference, taking college courses, or providing financial support for an advanced degree?
- Excellent
- Very Good
- Fair
- Poor

In general, how would you rate the ability of the UAF Geological Engineering graduates you employ to solve geological problems relevant to cold regions, especially Alaska?
- Excellent
- Very Good
- Fair
- Poor
- Unable to Rate
How well do the UAF Geological Engineering graduates employed by your company function on multi-disciplinary teams?
- Excellent
- Very Good
- Fair
- Poor
- Unable to Rate

How would you describe the ethical judgment and professional conduct of the UAF Geological Engineering graduates employed by your company?
- Excellent
- Very Good
- Fair
- Poor
- Unable to Rate

The Geological Engineering program has identified the following three forward-looking educational objectives and established an assessment process to assure the objectives are met successfully.
- Graduates will be employed in one of the following professional areas: mineral and energy exploration and development; geotechnical engineering; groundwater engineering; or geo-environmental engineering.
- Graduates will possess technical knowledge required to meet the unique challenges of geological engineering problems germane to cold regions, especially Alaska.
- Graduates will pursue life-long learning through continuing education opportunities, professional registration/certification, and/or graduate studies.

In your opinion, how successful is the UAF Geological Engineering program in accomplishing its educational objectives?
- Excellent
- Very Good
- Fair
- Poor
- Unable to Rate
Alumni survey results from graduates in the past 5 years (Survey date: February 2011; Number of responses: 5).

Employer survey results (Survey date: February 2011; Number of responses: 2).
CRITERION 3. STUDENT OUTCOMES

A. Student Outcomes

The GE program student outcomes put forward by the program’s faculty and constituents encompass the eleven outcomes specified by ABET Criterion 3 and one additional outcome. The optional outcome (outcome “l”) states “A knowledge of engineering applications as related to geological resources and geo-hazards in Alaska and an ability to practice engineering in arctic-related projects,” which is specifically included to meet UAF’s mission as the nation’s arctic university and to advance and disseminate knowledge through teaching with an emphasis on Alaska. Each of the GE courses is responsible for meeting two to three student outcomes, with expected levels of achievement between medium and high (see the table “GE Student Outcomes Assessment Matrix”). Each student outcome is further assessed by a set of performance indicators and mapped to the Program Educational Objectives. The table “Student Outcomes and Performance Indicators for the GE Program” summarizes current GE student outcomes and the associated performance indicators with which the outcomes are assessed. A similar table also can be found by clicking the link GE_performance_Indicators.pdf at http://www.alaska.edu/uaf/cem/ge/.

B. Relationship of Student Outcomes to Program Educational Objectives

As stated in Criterion 2 – Program Educational Objectives, the GE program has identified three forward-looking educational objectives and established an outcomes assessment process to assure that the objectives are met successfully. The level of relationship between each of the GE student outcomes and Program Educational Objectives is briefly described below, and summarized in the table “Relationship between GE Student Outcomes and Program Educational Objectives.”

While pursuing a college education at UAF, GE students are trained to acquire the fundamental knowledge and basic skills that will be needed in the early stage of their professional careers. From the Department of Labor’s statistics and our graduates’ employment records over the past decade, the GE faculty understand that the next decade’s job market for our graduates will be in the areas of mineral and energy exploration and development, geotechnical engineering, and groundwater/geo-environmental engineering. All of the employment areas listed in PEO #1 will require our graduates to work on multi-disciplinary teams (student outcome “d”) to develop economical solutions to geological engineering problems (student outcome “e”). In order to meet the minimum qualifications for employment, our graduates must have the ability to apply the principles of science, mathematics, and engineering (student outcome “a”); the ability to design and conduct experiments using modern tools, and to analyze lab test and field survey results (student outcomes “b” and “k”); the ability to communicate effectively in the workplace (student outcome “g”); and an understanding of his/her professional and ethical responsibilities (student outcome “f”).
GE Student Outcomes Assessment Matrix

<table>
<thead>
<tr>
<th>Student Outcomes</th>
<th>GE101</th>
<th>GE261</th>
<th>GE365</th>
<th>GE375</th>
<th>GE376</th>
<th>GE381/382w</th>
<th>GE405</th>
<th>GE420</th>
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Notes: The expected levels of achievement (H: high level with rating 4.0; M: medium level with rating from 3.5 to 4.0; and L: low level with rating from 2.5 to 3.5). Blue, bold letters denote the assessments used in this review cycle.

GE 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;
(c) 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;
(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) Knowledge of contemporary issues;
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice; and
(l) A knowledge of engineering applications as related to geological resources and geo-hazards in Alaska and an ability to practice engineering in arctic-related projects.
<table>
<thead>
<tr>
<th>Program Outcomes</th>
<th>Performance Indicators</th>
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| (a) An ability to apply knowledge of mathematics, science and engineering.       | 1. Understands the fundamentals of Physics, Chemistry, and Mathematics  
2. Understands the principles of Statics and Dynamics  
3. Successfully applies this knowledge to solve engineering problems |
| (b) An ability to design and conduct experiments, as well as to analyze and interpret data | 1. Specifies necessary instruments to conduct an experiment  
2. Develops and/or follows experimental procedure  
3. Uses appropriate graphs or tables to display and interpret results  
4. Analyzes results to form a conclusion about the experiment |
| (c) 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. | 1. Understands the key components and parameters of a system or a process  
2. Utilizes resources to obtain information about a system or a process  
3. Addresses an issue or solve a problem |
| (d) An ability to function on multi-disciplinary teams                          | 1. Demonstrates understanding of team roles when assigned  
2. Assumes individual and team responsibility  
3. Recognizes and appreciates varied backgrounds of team members |
| (e) An ability to identify, formulate, and solve engineering problems             | 1. Recognizes geological engineering-related issues using desk-top analytical approach  
2. Designs a plan to solve the engineering problem  
3. Provides a solution to the engineering problem |
| (f) An understanding of professional and ethical responsibility                   | 1. Shares professional knowledge with other team members  
2. Shows professional respect and courtesy toward classmates and team members  
3. Demonstrates exemplary work ethics  
4. Acknowledges contribution or work of others |
| (g) An ability to communicate effectively                                          | 1. Uses correct grammar, spelling, and punctuation in written reports, and pronunciation in verbal communication  
2. Understands the background knowledge of the readers or audience, and organizes the information to meet the needs  
3. Assesses readers or audience response  
4. Provides factual statements supported with evidences |
<table>
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<tr>
<th>Outcomes</th>
<th>Student Outcomes</th>
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<tr>
<td><strong>(h)</strong> The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.</td>
<td>1. Gains knowledge of engineered solutions specific to geological engineering 2. Extends the solution to understand an alternate in a global, economic, environmental or societal context 3. Identifies modifications necessary to adapt to an alternate context</td>
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<td><strong>(i)</strong> A recognition of the need for, and an ability to engage in lifelong learning</td>
<td>1. Understands the need for continual technical and professional enhancement 2. Recognizes professional registration as a desirable attainment of the practice 3. Accepts and welcomes objective peer review</td>
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<tr>
<td><strong>(j)</strong> Knowledge of contemporary issues</td>
<td>1. Demonstrates knowledge of diverse standards, regulations, and constraints applicable to Geological Engineering Practice 2. Demonstrates knowledge of contemporary issues within the context of Geological Engineering profession</td>
</tr>
<tr>
<td><strong>(k)</strong> An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice</td>
<td>1. Identifies and applies current techniques to solve Geological Engineering problems 2. Demonstrates skills in operating laboratory and field test equipment 3. Understands the benefits and limitations of modern engineering tools used in routine engineering practice</td>
</tr>
<tr>
<td><strong>(l)</strong> A knowledge of engineering applications as related to geological resources and geo-hazards in Alaska and an ability to practice engineering in arctic-related projects</td>
<td>1. Recognizes geologic characteristics of geo-hazards and geological resources in Alaska 2. Identifies engineering issues associated with arctic and subarctic environments 3. Uses skills and techniques to solve engineering problems related to frozen ground</td>
</tr>
</tbody>
</table>

The unique environment in Alaska requires our graduates to obtain knowledge germane to cold regions, such as the geological characteristics of arctic and subarctic environments and engineering issues associated with frozen ground. Student outcome “l” is specifically designed to meet PEO #2. Our graduates also are trained to understand the importance of economic, environmental, political, social, and ethical constraints in Alaska, and to assess their impacts to engineering projects (student outcome “c”). Even though GE graduates will acquire knowledge pertinent to cold regions, the GE curriculum offers a broad education, including topics in geology, geotechnical/geomechanical applications, groundwater/geo-environmental applications, and mineral, oil, and gas exploration. This broad education provides GE graduates with the ability to find alternate solutions to engineering problems in the economic, environmental, or societal context (student outcome “h”).

The professional areas in which our graduates are employed often require continuing education to retain the currency of technical knowledge and skills (PEO #3). GE students are constantly reminded of the importance of lifelong learning through attending workshops/conferences, taking college courses, and pursuing advanced degrees and/or professional registration and
certification while working (student outcome “i”). Expertise is required in every field, and expertise depends, in part, on knowledge and experience with contemporary engineering issues. Knowledge and experience further depend on the availability of new methods or techniques. Our graduates are responsible for engineering ventures that occur on a regular basis. To ensure that they will develop the expertise in their professional careers, GE students are given opportunities to use modern engineering tools for class projects, and in GE courses, they are exposed to examples of contemporary issues facing geological engineers (student outcome “j”).

**Relationship between GE Student Outcomes and Program Educational Objectives**

<table>
<thead>
<tr>
<th>Student Outcomes</th>
<th>Program Educational Objectives</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>PEO # 1</td>
</tr>
<tr>
<td>(a) An ability to apply knowledge of mathematics, science, and engineering.</td>
<td>H</td>
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<tr>
<td>(b) An ability to design and conduct experiments, as well as to analyze and interpret data</td>
<td>H</td>
</tr>
<tr>
<td>(c) 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.</td>
<td>M</td>
</tr>
<tr>
<td>(d) An ability to function on multi-disciplinary teams</td>
<td>M</td>
</tr>
<tr>
<td>(e) An ability to identify, formulate, and solve engineering problems</td>
<td>H</td>
</tr>
<tr>
<td>(f) An understanding of professional and ethical responsibility</td>
<td>M</td>
</tr>
<tr>
<td>(g) An ability to communicate effectively</td>
<td>M</td>
</tr>
<tr>
<td>(h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.</td>
<td>M</td>
</tr>
<tr>
<td>(i) A recognition of the need for, and an ability to engage in life-long learning</td>
<td>M</td>
</tr>
<tr>
<td>(j) Knowledge of contemporary issues</td>
<td>M</td>
</tr>
<tr>
<td>(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice</td>
<td>M</td>
</tr>
<tr>
<td>(l) A knowledge of engineering applications as related to geological resources and geo-hazards in Alaska and an ability to practice engineering in arctic-related projects</td>
<td>M</td>
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</table>

H: high level;  M: medium level;  L: low level
CRITERION 4. CONTINUOUS IMPROVEMENT

Critical processes to a successful academic program involve a series of actions based on the needs of the program’s constituents, which include students, alumni, and employers/friends in industry and government. With input from constituents, the GE program establishes its educational objectives. Program educational objectives (PEOs) are measured for their efficacy by an outcomes assessment plan of the students and graduates. Curricular and course modifications are implemented, should there be a minor deficiency. This shortcoming further necessitates an evaluation of the student outcomes and program educational objectives, if the outcomes assessment reveals a major weakness in the program.

Faculty, students, and the advisory board, with alumni and representatives from industry and government agencies, approved two revisions to the GE PEOs, which were first introduced in 2000. The revisions took into account, among several factors, the employment trend for GE graduates in recent years and faculty expertise. The current PEOs of the GE program describe career and professional accomplishments that graduates will achieve in the first five years after graduation—skills and knowledge with an emphasis on Alaskan problems.

Student outcomes for the GE program encompass the eleven outcomes specified by ABET Criterion 3 and one additional outcome related to Alaska issues. The revision was necessary to align student outcomes with the program’s second PEO, that the GE program strives to help accomplish UAF’s mission as “America’s arctic university.”

A. Program Educational Objectives

As stated in Criterion 2 – Program Educational Objectives, the GE PEOs were revised twice in this review cycle (i.e., 2005 to present) through assessments by GE faculty, the advisory board, students, alumni, and employers. The graph entitled “GE PEOs Assessment Timeline” shows the major event schedule that led to the current version of the PEOs. The table entitled “GE PEOs Assessment Process and Outcomes” summarizes the assessment methods used to gather data pertinent to evaluation of the PEOs, information collected in the assessment, frequency/dates of assessment, and the results and levels of achievement in attaining the PEOs. The table is followed by a more detailed presentation of the assessment results in footnotes and graphs.

Between 2007 and 2011, the GE program, in the process of closing the loop, made major revisions to the PEOs. These changes were initiated by a critical review of the advisory board and subsequently by a new faculty hire. During this process, the domain of GE education was broadened to include technical knowledge germane to cold regions instead of the much-focused-on region of Alaska. The fields of employment were refined to reflect what GE graduates do best in mineral and energy, geotechnical, groundwater, and geo-environmental engineering industries. The professional areas in which our graduates are employed often require continuing education to retain the currency of their technical knowledge and skills. In order to emphasize the importance of life-long learning, the third PEO was broadened to include not only advanced studies at college but also the acquiring and updating of various abilities, interests, knowledge, and qualifications through continuing education and registration and/or certification.
In order to execute the PEOs successfully, contents of some of the GE courses were modified to include hands-on, real-world projects through homework assignments, lab exercises/field surveys, and term projects. This project-oriented/project-emphasized approach benefits our students with a deeper understanding of engineering concepts. A detailed discussion of this improvement is included in Section B of this Criterion.

The GE program conducted online alumni and employer surveys from mid-February to mid-March 2011. These survey results, which relate to PEOs overall, are summarized in two graphs in Criterion 2. The opinions of both alumni and employers indicate that, on the whole, the GE PEOs have been achieved with a level of success ranging from Fair to Very Good. The employer reviews split evenly between Fair and Very Good, and the alumni reviews spread between Fair and Excellent with an average of Very Good. A more in-depth analysis of each of the GE PEOs reveals that most (80%) of the GE alumni, some after a few years of industrial employment, have returned to college for advanced degrees. Most rated their technical knowledge for Alaska-related projects as Very Good, varying in range between Fair and Excellent. The average survey result (Very Good) in this category is similar to the expected level of achievement for PEO #2. All (100%) of them have taken life-long learning opportunities since graduating from the GE program. The participation of our graduates in life-long learning activities (PEO #3) far exceeds the program’s expectation of 60% to 70%. Employer reviews on GE graduates’ technical knowledge of Alaska-related projects varied between Fair and Very Good, which is slightly lower than the expected level of achievement (i.e., Very Good) for PEO #2. Life-long learning opportunities provided by employers ranged between Fair and Very Good, which indicates that our graduates will have means to improve their knowledge and skills while working for their employers. (Please see graphs titled “2011 alumni survey results of the GE PEOs” and “2011 employer survey results of the GE PEOs.”)

GE faculty are happy to know that the program has delivered quality education to its graduates and strive to improve future outcomes. The overall survey results have met the expected level of achievement (i.e., Fair to Very Good) for the three PEOs. The survey results, archived in the department ABET drive with printed copies stored in the GE ABET coordinator’s office, will be incorporated in the next cycle of self-assessment of the curriculum and its PEOs.

As stated in Criterion 2, GE faculty and the advisory board have adopted a formal process that allows systematic and periodic review and modification of educational objectives in the future. The process is summarized below:

- The GE faculty initiate review of the student outcomes assessment, conduct alumni and employer surveys, and propose changes to the PEOs;
- The revised PEOs are forwarded to the advisory board members for their reviews and suggestions;
- Suggestions from the advisory board members are incorporated and reviewed by GE student representatives;
- The final PEOs are resubmitted to the advisory board for approval; and
- The approved PEOs are posted in the UAF catalog and online catalog, and on the GE website.
<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Frequency/Date</th>
<th>Chronological Events</th>
<th>Outcomes</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td>Advisory Board Review</td>
<td>Once to twice annually (March &amp; November from 2005–2009 &amp; November from 2009–present)</td>
<td>In 2007, advisory board reviewed the GE proposal to remove the 4th PEO related to faculty academic duties.</td>
<td>Proposal approved with 3 PEOs identical to the first three objectives in the 2005 ABET report.</td>
<td>See Footnotes #1–#3 for details</td>
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<td>In 2008 GE Advisory Board meeting and subsequent communications in 2009–10, GE requested approval of changes of the PEOs.</td>
<td>Interim GE PEOs were approved in 2010 with the 1st PEO modified and slight revision of the 2nd and 3rd PEOs.</td>
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<td>In October 2010, language of the interim GE PEOs was slightly modified by faculty and was approved by the board.</td>
<td>The current GE PEOs are in compliance with new ABET criteria.</td>
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<tr>
<td>Alumni Survey</td>
<td>June 2010 &amp; February 2011</td>
<td>In 2010 survey, the alumni (target group: graduated &lt; 2 years) agreed (strongly agreed for PEO #1) that the program has prepared them to meet the interim GE PEOs.</td>
<td>The survey results did not result in a major modification of GE PEOs. Minor change of the language was made.</td>
<td>See Footnotes #4 &amp; #5 &amp; graphs below for details</td>
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<td>In 2011 survey, the alumni (target group: graduated &lt; 5 years) rated the level of success in meeting the GE PEOs from Excellent to Fair with majority at Very Good (see the graph titled “2011 alumni survey results of the GE PEOs” below).</td>
<td>The survey results will be incorporated in the next cycle of self-assessment of the curriculum and its PEOs.</td>
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</table>
In consultation with the GE Advisory Board during a meeting in 2008 (see the GE Program Evaluation by Frank Wuttig, Shannon & Wilson, Inc. in Criterion 2) and subsequent communications in 2009–10, and in view of new faculty hire in January 2008, the first educational objective (PEO #1) of the GE program was modified to reflect the expertise of the current faculty members and the professional areas in which our graduates seek employment.

In the process of revising the program objectives in 2008 and 2009–10, the advisory board also suggested that the term “cold regions” be used in lieu of “the North.” The argument for this terminology change was that the GE curriculum at UAF focuses on geological engineering education in cold regions, which encompasses a much larger area than the northern region. This action resulted in a revised PEO #2 with minor language change.

Life-long learning promotes the development of knowledge and competence of our graduates throughout their careers, to say the least. In order to emphasize this idea, GE faculty and the advisory board, in the same assessment process as mentioned above, broadened the third educational objective (PEO #3) of the GE program to include not only advanced studies in college but also the acquiring and updating of various abilities, interests, knowledge, and qualifications. The statement “the pursuit of life-long learning” was thus added to PEO #3.

In June 2010, a survey of the program outcomes and the interim educational objectives was sent to recent graduates who had graduated within the last 2 years (see June 2010 survey results in Criterion 2).

In February 2011, online alumni and employer surveys were conducted to assess how successfully the new GE PEOs have been met (see some of the survey results in Criterion 2). The target group of alumni was those who had graduated from the GE program in the last five years. Please see graphs “2001 alumni survey results of the GE PEOs” and “2011 employer survey results of the GE PEOs” below.
2011 alumni survey results of the GE PEOs.
2011 employer survey results of the GE PEOs.
B. Student Outcomes

As stated in Criterion 3 – Student Outcomes, twelve items are encompassed in student outcomes for the GE program. These student outcomes are reviewed annually by GE faculty and graduating seniors, and every several years by alumni and employers. Results of the FE exam taken by GE seniors also are one of the key assessment methods.

GE faculty assess student outcomes based on the academic performance of their students who are still studying at UAF. Following the GE assessment plan, information is generated and used to make changes in the curriculum and improve course delivery. Performance of GE graduates, measured through alumni and employer surveys, is compared with the expected level of achievement articulated in the PEOs. During the entire process, all GE faculty members are involved in program curriculum design, course delivery, course and student outcomes assessment, and implementation of curricular and outcomes changes, if needed. In addition, feedback from alumni, graduating seniors, and employers provides the rationale for course improvement and curriculum change, if warranted.

In this review cycle, the GE program has undertaken several significant changes to improve the quality of education and student outcomes. The changes were mostly initiated in a self-review by our own faculty and an external review by the advisory board. Additional prerequisites requirements, new course delivery methods, and an addition of cold regions-related topics were part of the changes. More-measurable performance indicators replaced the previous assessment methods used in the 2005 ABET review.

The table titled “GE Student Outcomes Assessment Process and Results” summarizes the assessment methods used to gather data pertinent to student outcomes evaluation, information collected in the assessment, frequency/dates of assessment, and the results and levels of achievement in attaining the outcomes. The table is followed by a more detailed discussion and presentation of the assessment results in footnotes and graphs.

The GE program employs a variety of tools to accumulate the data needed to assess its student outcomes. The quality of GE core courses is a key parameter on which GE faculty rely. Assessment of performance indicators assigned to each course, pre- and post-course surveys, and self-evaluation by course instructor are common methods used. Each of the GE faculty assures that the contents of his/her courses are current and consistent with the student outcomes. Course contents are reviewed on an annual basis by the faculty member teaching the course. Revisions of course contents and lecturing techniques are made by the program’s entire faculty, if necessary.

The table entitled “Results of Geological Engineering Student Outcomes Assessment” summarizes the assessment results of GE student outcomes based on each of the program’s core courses between 2009 and 2011. Each of the core courses is assigned two to three program outcomes. Each course has a set of performance indicators that forms the basis for assessing the performance of the course in meeting its assigned student outcomes. The graph with the caption “Comparison between the expected levels of achievement and the assessed levels of achievement by courses” shows the distribution of GE student outcomes scores. From the assessment by courses, most of the student outcomes have met the expected level of achievement with outcomes “d,” “e,” “g,” and “i” exceeding the expectation, and outcome “j”
The instructor’s self-assessment for GE 471 reveals that although contemporary geological engineering issues were mentioned in the course, students seemed not to fully comprehend the contemporary issues within the context of the geological engineering profession. A comparison between 2009 and 2010 classes indicates a solid improvement of outcome “j” though. Presently, no action is proposed for GE 471. The program will continue to observe the assessment results before making any decision. The assessment results from each of the GE courses and results from other methods will be incorporated in future review of the GE curriculum. Changes of one of the required geology courses (e.g., Ore Deposits and Structure vs. Structure Geology), prerequisites of several GE courses, and offering frequency of summer field classes and technical courses are in our future plan of action.

In the 2010 alumni survey, GE graduates responded with scores of all twelve outcomes ranging between 4 and 5 and an average of 4.53 (see graph “Results of GE student outcomes assessments from 2010 alumni surveys and 2011 graduating seniors exit interviews”). In the 2011 exit interview with graduating seniors, most of the responses were above 4 with one outcome (outcome “h”) below 4. The overall average was 4.25. The combined results between the alumni and graduating senior show a range between 4.0 and 4.7 with an overall average of 4.39. All student outcomes from both groups are above the expected levels of achievement. In the 2011 online survey, employers were asked specifically to evaluate GE graduates based on outcomes “d” and “f.” Their responses were evenly split between Very Good (4.0) and Excellent (5.0). The results from employer surveys were comparable to the responses from both graduating seniors and alumni; the employers considered GE graduates to have acquired both the ability to function on multiple teams and the understanding of their ethical and professional responsibility in the companies.

Based on FE exam records between April 2006 and April 2010, GE graduating seniors had an average passing rate of 55.5% as compared with the national rate of 56.8%. Although the passing rate is not high, it is comparable with the passing rates of geological engineering students in the nation.
## GE Student Outcomes Assessment Process and Results

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Frequency/Date</th>
<th>Chronological Events</th>
<th>Outcomes</th>
<th>Remarks/Expected Level of Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Assessment</td>
<td>Once annually (at the end of semester in which the courses are offered)</td>
<td>Additional prerequisites for some of the GE courses proposed</td>
<td>Prerequisites were approved by Faculty Senate and Provost</td>
<td>Students are not allowed to take courses out of sequence. See Footnote #1 for details</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Performance indicators implementation for all GE courses</td>
<td>A set of measureable indicators are assigned to each of the student outcomes. All of the student outcomes but outcome “j” have met or exceeded the expected levels of achievement. Continuing observation of student outcomes in GE 471.</td>
<td>See Footnote #2 for details &amp; graph “Comparison between the expected levels of achievement and the assessed levels of achievement by courses”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Implementation of the project-oriented approach in some of the GE courses</td>
<td>Students gain deeper understanding of GE-related engineering problems and search for solutions with alternative approaches.</td>
<td>See Footnote #3 for details</td>
</tr>
<tr>
<td>Alumni Survey</td>
<td>June 2010</td>
<td>Responses of GE graduates with scores of all twelve outcomes ranging between 4 and 5 and an average of 4.53</td>
<td>The survey results did not result in a major modification of GE curriculum.</td>
<td>See graph titled “Results of GE student outcomes assessments from 2010 alumni survey and 2011 graduating seniors exit interview” for breakdowns</td>
</tr>
<tr>
<td>Exit Interview</td>
<td>Once annually in May</td>
<td>Responses of 2011 graduating seniors with rating above 4 for all student outcomes but outcome “h.” The overall average was 4.25.</td>
<td>Add examples in courses to improve student’s understanding of the impact of engineering solutions in a global, economic, environmental, and societal context.</td>
<td>See graph titled “Results of GE student outcomes assessments from 2010 alumni survey and 2011 graduating seniors exit interview” for breakdowns</td>
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<tr>
<td>Employers Survey</td>
<td>Once in 2011 (questions related student outcomes “d” and “f”)</td>
<td>Employer ratings of student outcomes “d” and “f” between Very Good and Excellent.</td>
<td>No change to curriculum or courses due to this assessment is proposed at the present time</td>
<td>See Footnote #4 for breakdowns</td>
</tr>
<tr>
<td>Graduating Senior FE Exam</td>
<td>Twice annually (April &amp; October)</td>
<td>An average FE passing rate of 55.5% as compared with the national rate of 56.8% between April 2006 and April 2010.</td>
<td>GE graduates have possessed the fundamental engineering and science skills comparable to graduates from other universities.</td>
<td>See Footnote #5 for breakdowns</td>
</tr>
<tr>
<td>Society Activities</td>
<td>Once annually for AEG, AMA, and local ASPE meeting</td>
<td>Student’s oral and poster presentations, and award and recognition</td>
<td>Students gain opportunities to speak publically meeting student outcome “g” with a high level of achievement.</td>
<td>See Footnotes #6 for details</td>
</tr>
<tr>
<td>Advisory Board Review</td>
<td>Once to twice annually (March &amp; November from 2005–2009 &amp; November from 2009–present)</td>
<td>Critical review in 2008 with report by Frank Wuttig</td>
<td>Inclusion of cold region topics in the GE courses.</td>
<td>See Footnote #7 for details</td>
</tr>
</tbody>
</table>

1 In order to prevent students from taking courses out of sequence, which results in failing in their studies, changes of prerequisites for several GE courses were made between 2005 and 2010 and approved by the Provost. Changes include replacing a lower-division GE prerequisite (GE 261) with a higher-division prerequisite (GE 365) for GE 420 – Subsurface Hydrology, and replacing GE 261 with GE 375 for GE 471 – Remote Sensing for Engineering (see 2007–08 catalog). GE 480 – Senior Design requires students in the class to have senior status, with completion of GE 261, GE 365, GE 375, GE 381 or equivalent, GE 382 or equivalent, GE 405, GE 420, and GE 471 (see 2008–09 catalog). GE 405 – Exploration Geophysics has one additional prerequisite (GE 375), and the summer field camp (GE 381 and GE 382) includes two additional prerequisites: GEOS 213 and GEOS 214 (see 2010–2011 catalog).

2 In order to provide students with quality education, GE faculty have developed and implemented a set of “performance indicators” in instruction, based on student performance, success of course delivery, and student outcomes assessment. Such measurable indicators help the GE program define and evaluate how
successful students are at making progress toward the educational objectives. The details of the outcomes assessment using performance indicators are discussed in Criterion 3.

GE faculty understand well that graduates’ ability to succeed in the job market requires a level of knowledge that prepares them to solve real-world problems. GE faculty also understand well the benefits (e.g., a deeper understanding of engineering concepts) of engaging our students by solving hands-on, real-world problems. In several of our GE core courses, we have used project-based learning. As a case in point, GE 480 – Senior Design requires students to work in teams, submit proposals in response to RFPs, and complete the final design reports based on proposals submitted. Each year, students are trained to undertake engineering projects, which are vital to future economic growth in Alaska. GE 440 – Slope Stability requires students to analyze discontinuity survey data, carry out kinematic analysis and limited equilibrium analysis, and provide a slope stabilization plan for a given slope design project. GE 405 – Exploration Geophysics trains students with hands-on practice. Students are required to design experiments for geophysical surveys, conduct field surveys, analyze measurements, and interpret and verify the results. Often, survey sites are selected with industry and/or government partners, and are in a permafrost environment. GE 375 – Principles of Engineering Geology and Terrain Analysis incorporates the use of GIS in the class project, which requires students to conduct terrain analysis for engineering projects within Alaska. GE 365 – Geological Material Engineering teaches students the fundamentals of soil mechanics with many examples related to Alaskan construction, and students incorporate the results of their weekly laboratory tests into a technical report summarizing a hypothetical subsurface investigation for a proposed construction project within Alaska. Although the topics in the above-mentioned GE courses are not combined in a stand-alone permafrost engineering course (as suggested by one of the advisory board members), our students have received adequate exposure to permafrost engineering through this curricular arrangement.

The employer reviews were evenly split between Very Good and Excellent.

GE at UAF % passing (National % passing): April 2006 – 100% (67%); April 2007 – 0% (71%); April 2008 – 50% (56%); October 2008 – 50% (43%); April 2009 – 100% (60%); April 2010 – 33% (44%).

External competitions and recognitions often indicate the degree of success an educational program has achieved. GE students are encouraged to participate in local and national professional societies and present their class projects, research, and senior design project in conferences and meetings. In the past several years, five student presentations were made at the annual AEG meeting (i.e., Will Robinson in 2008, Kyle Obermiller in 2009, Peppi Bolz, Christine McCabe, Maggie Yngve in 2010). In the September 2011 AEG meeting in Anchorage, Alaska, about 13 GE students will assist the Organizing Committee, and some of these students will present abstracts. The ability for our students to present their projects in professional societies at the national level clearly demonstrates their competency and the quality of the GE education. Several of our senior students have received awards by professional societies in the year they graduated. For example, Kyle Obermiller, a 2010 graduate, was recognized in the AEG Newsletter, Tonya Lloyd, a 2009 graduate, received the 2009 Student Engineer of the Year Award from the Alaska Society of Professional Engineers (ASPE), and Casey Adamson, a 2006 graduate, won a similar award in 2006. These awards further confirm that the GE program has been quite successful in meeting its own educational objectives.

Mr. Frank Wuttig, a member of the GE Advisory Board and employer of our alumni, together with the rest of the board members reviewed the GE program in 2008, and presented an evaluation report suggesting several changes (see the letter from Frank Wuttig in Criterion 2). GE faculty have been working on some of the suggestions ever since. Improvement of students’ technical writing skills is one of the program’s urgent tasks. Several of the GE courses are project-oriented, and project reports are an integral part of the courses. In some classes, students are required to submit draft reports for critical review and editing by the instructors. Although most of the GE courses are not writing intensive, we have treated them as if they are. Through this repetitive writing training in many of the GE core courses, our students have gained enormous practice in technical writing. Because of the constraint of increasing the required graduation credit beyond 134 credits, the program has not been able to add the permafrost engineering course to its curriculum. However, by emphasizing arctic-related projects in the GE courses, our students, upon graduation, have sufficient training and exposure to permafrost science and engineering.
<table>
<thead>
<tr>
<th>Student Outcomes</th>
<th>GE101</th>
<th>GE261</th>
<th>GE365</th>
<th>GE375</th>
<th>GE376</th>
<th>GE381/382w</th>
<th>GE405</th>
<th>GE420</th>
<th>GE440</th>
<th>GE471</th>
<th>GE480w</th>
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<td>4.2</td>
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Notes: The expected levels of achievement (H: high level with rating ≥ 4.0; M: medium level with rating from 3.5 to 4.0; and L: low level with rating from 2.5 to 3.5). Blue, bold letters denote the assessments used in this review cycle. Rating is rescaled from a range of 0 to 4 to a new range of 0 to 5.

GE 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;
(c) 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;
(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) Knowledge of contemporary issues;
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice; and
(l) A knowledge of engineering applications as related to geological resources and geo-hazards in Alaska and an ability to practice engineering in arctic-related projects.
Comparison between the expected levels of achievement and the assessed levels of achievement by courses.

Results of GE student outcomes assessments from 2010 alumni surveys and 2011 graduating seniors exit interviews.
Comparison between the expected levels of achievement and the assessed levels of achievement by alumni and graduating seniors. (★: employers’ review).

C. Continuous Improvement.

As stated in the previous two sections of Criterion 4, the GE program has undertaken a major change of the educational program objectives resulting from the outcomes assessment process. A new set of three PEOs was introduced and approved in 2010. As a result of this process, changes in the student outcomes also were initiated, and a new method of assessment using performance indicators was adopted in the GE courses.

The following briefly reiterates the activities involved in the continuous improvement of the GE program and the rationales of the changes:

- Between 2007 and 2010, the GE program made major revisions to the PEOs. The changes were initiated by a review of the advisory board and a new faculty hire. In the process, the domain of the GE education was broadened to include technical knowledge germane to cold regions instead of mainly Alaska. Fields of employment were refined to reflect what GE graduates do best in related industries, and the third PEO was broadened to include not only advanced studies in college but also the acquiring and updating of various abilities, interests, knowledge, and qualifications through continuing education, and registration and/or certification.

- Between 2007 and 2010, a new (the twelfth) student outcome was approved that emphasizes a student’s knowledge of engineering application as it relates to geological resources and geo-hazards in Alaska and his/her ability to practice engineering in arctic-related projects. This change was in response to internal and external reviews.

- In order to execute the PEOs successfully and exceed the expected levels of achievement of student outcomes, contents of some of the GE courses were modified to include hands-on, real-world projects through homework assignments, lab exercises/field surveys, and...
term projects. This project-oriented/project-emphasized approach benefits our students by giving them a deeper understanding of engineering concepts.

- The GE program has undertaken several significant changes to improve the quality of education. Additional prerequisites requirements, new course delivery methods, and cold regions-related topics embedded in several of the GE courses were part of the changes. More-measurable performance indicators replaced the previous assessment methods used in the 2005 ABET review. Additional prerequisites requirements are needed to assure that GE students have the necessary background for the next more-advanced technical courses.

- Continuous improvement of GE courses is being made via thorough reviews of course outcomes and implementation of the action plans. GE course assessments and action plans are archived and will be available during the ABET campus visit (see the example in Section D – Additional Information).

- The GE program will continue to observe course assessment results. The assessment results from GE courses, alumni and employer surveys, exit interviews, and reviews by the advisory board will be incorporated in future review of the GE program, including educational objectives and student outcomes. Changes in one of the required geology courses (e.g., Ore Deposits and Structure vs. Structure Geology) and prerequisites of several GE courses, and offering frequency of summer field classes and technical courses are in our future plan of action. The proposed change of the geology course is needed because our students have not shown adequate knowledge in structure geology, which is often needed in geo-engineering projects. Continuous buy-out of one of the GE faculty members has had an impact on the course offering. Rotating the offering of technical electives has alleviated some of the burden on faculty. However, a long-term solution must be found before the quality of education starts to decline.

D. Additional Information

The assessment results, course syllabi, sample student work (e.g., homework assignments, lab reports, quizzes and exams, term projects and design reports) are stored in the department’s ABET computer hard drive. All digital files stored in the hard drive will be made available to the reviewer before the visit, if it is preferred. Printed documents, which supplement the archived digital files, are stored in the department conference room (301B DUCK) for the ABET team to inspect at the time of the visit.

In order to facilitate review by the ABET team, the following briefly describes the electronic files stored within each of the GE course folders. Although the number of sub-folders and files may not be the same between different courses, the organizational structure is similar. Hereinafter, GE 261 – General Geology for Engineers (see graph “Electronic file organization structure of GE courses”) is used as an example.

The folder “GE 261” contains several files and folders. The individual files include (1) Assessment of Course Performance GE261, (2) Program Outcomes Assessment Results and Action Plan_261 (see the following tables), (3) GE261 Syllabus 2011_ABET, and (4) others such as surveys. The three folders are (1) Student Work, (2) Assignments, Labs, and (3) Course
Lectures. Within the “Student Work” folder are two sub-folders: “2010” and “2011.” In each folder are several other folders of graded student homework, quiz, labs, exams, etc. The “Assignment, Labs” folder contains homework and lab assignments. The “Course Lectures” folder contains lecture notes used in the class.

Included in the report is a chart (see the chart “GE ABET Preparation Timeline”) that illustrates the schedule of ABET preparation in the last six months. Email communication between faculty members is stored in faculty computers and will be made available during the campus visit, if ABET reviewers desire to go through them.
Electronic file organization structure of GE courses (Example folder “GE 261”).
Assessment of Course Performance – GE 261

Outcome “d”: An ability to function on multi-disciplinary teams
Performance Indicator 2 – Assumes individual and team responsibility

<table>
<thead>
<tr>
<th>Student</th>
<th>Source of Assessment</th>
<th>Evaluation of Performance</th>
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</thead>
<tbody>
<tr>
<td>Student 1</td>
<td>Teamwork during Laboratory exercises</td>
<td>Exemplary</td>
</tr>
<tr>
<td>Student 2</td>
<td></td>
<td>Exemplary</td>
</tr>
<tr>
<td>Student 3</td>
<td></td>
<td>Exemplary</td>
</tr>
</tbody>
</table>

Unsatisfactory (score=1), Developing (score=2), Satisfactory (score=3), and Exemplary (score=4)

Outcome “d”: An ability to function on multi-disciplinary teams
Performance Indicator 3 – Recognizes and appreciates varied backgrounds of team members

<table>
<thead>
<tr>
<th>Student</th>
<th>Source of Assessment</th>
<th>Evaluation of Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 1</td>
<td>Teamwork during Laboratory exercises</td>
<td>Exemplary</td>
</tr>
<tr>
<td>Student 2</td>
<td></td>
<td>Exemplary</td>
</tr>
<tr>
<td>Student 3</td>
<td></td>
<td>Exemplary</td>
</tr>
</tbody>
</table>

Unsatisfactory (score=1), Developing (score=2), Satisfactory (score=3), and Exemplary (score=4)

Outcome “h”: An ability to understand the impact of engineering solutions in a global context
Performance Indicator 1 – Gains knowledge of engineered solutions specific to geological engineering

<table>
<thead>
<tr>
<th>Student</th>
<th>Source of Assessment</th>
<th>Evaluation of Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 1</td>
<td>Lab 9, prob. 14</td>
<td>Developing</td>
</tr>
<tr>
<td>Student 2</td>
<td></td>
<td>Satisfactory</td>
</tr>
<tr>
<td>Student 3</td>
<td></td>
<td>Exemplary</td>
</tr>
</tbody>
</table>

Unsatisfactory (score=1), Developing (score=2), Satisfactory (score=3), and Exemplary (score=4)

Outcome “h”: An ability to understand the impact of engineering solutions in a global context
Performance Indicator 2 – Extends the solution to understand an alternate global, economic, environmental, or societal context

<table>
<thead>
<tr>
<th>Student</th>
<th>Source of Assessment</th>
<th>Evaluation of Performance</th>
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</thead>
<tbody>
<tr>
<td>Student 1</td>
<td></td>
<td>Satisfactory</td>
</tr>
<tr>
<td>Student 2</td>
<td>Lab 11, prob. 16, 17</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>Student 3</td>
<td></td>
<td>Satisfactory</td>
</tr>
</tbody>
</table>

Unsatisfactory (score=1), Developing (score=2), Satisfactory (score=3), and Exemplary (score=4)
GE 261 Program Outcomes Assessment Results and Action Plan

Program Outcome (d): An ability to function on multi-disciplinary teams

<table>
<thead>
<tr>
<th>Performance Indicator</th>
<th>Strategies</th>
<th>Source of Assessment</th>
<th>Assessment Method(s)</th>
<th>Time of Data Collection</th>
<th>Assessment Coordinator</th>
<th>Evaluation of Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Demonstrates understanding of team roles when assigned</td>
<td>GE261</td>
<td>----</td>
<td>Teamwork during Laboratory exercises</td>
<td>----</td>
<td>----</td>
<td>Program Faculty</td>
</tr>
<tr>
<td>2. Assumes individual and team responsibility</td>
<td>GE261</td>
<td>GE261</td>
<td>2011</td>
<td>Darrow</td>
<td>Program Faculty</td>
<td></td>
</tr>
<tr>
<td>3. Recognizes and appreciates varied backgrounds of team members</td>
<td>GE261</td>
<td>GE261</td>
<td>2011</td>
<td>Darrow</td>
<td>Program Faculty</td>
<td></td>
</tr>
</tbody>
</table>

Results Spring 2010: GE261 is a required class for GE, MIN, CEE, and PETE majors, and therefore is a natural opportunity for students to work in multi-disciplinary teams. During the first lab, student teams were assigned, to include students from each major and a mix of men and women. At several points in the semester, students are required to work on a group team activity as part of a lab. A sample of 50 students (including GE, MIN, CEE, and PETE majors) were assessed. During the course, students evaluated each other on teamwork on a scale of 1 to 5, and were also evaluated by the TA and the Instructor. Scores ranged from 4 to 5, with an average of 4.8. On the pre-course survey, 52% indicated that they already had a strong ability to work in multi-disciplinary teams. On the post-course survey, 42% of the students indicated no change in their abilities, whereas 58% indicated a stronger or much stronger ability as a result of the course. The high percentage indicating no change highly corresponds to the high percentage that indicated highly developed skills at the beginning of the course. For a teamwork orienteering activity, students commented on the necessity of being able to work with others in a field activity.

Actions 2010: The assigned multi-disciplinary teams worked well. Working on these assigned teams took several students out of their comfort level initially. Shy students appeared to forge new friendships with their teammates. The peer evaluation using rubrics was marginally successful, but useful when issues within the team were present. The group team activities were useful, and were used again in 2011. The orienteering activity was also kept for 2011, and expanded slightly to include more participants.

Results Spring 2011: A sample of 61 students (including GE, MIN, CEE, and PETE majors) were assessed. During the course, students evaluated each other on teamwork on a scale of 1 to 4, and were also evaluated by the TA and the Instructor. Scores ranged from 3 to 4, with an average of 3.96. Several students commented on how great it was to work with their group. On the pre-course survey, 95% of the students indicated that they already had an adequate to strong ability to work in multi-disciplinary teams. On the post-course survey, 37% indicated no change since they were already able to work on teams prior to the class. 63% indicated a stronger or much stronger ability as a result of the course. Three GE and MIN students were selected for overall evaluation. These three students demonstrated an Exemplary ability to work in multi-disciplinary teams.
**Actions 2011:** Students will continue to be assigned multi-disciplinary teams for laboratory exercises. The group team activities were useful, and will be used again in 2012. The continuing problem is the assessment of the ability to work in the teams beyond TA and instructor observations. The students are not forthcoming with a true assessment; to add more anonymity to the process, a confidential survey will be set up in Blackboard in 2012. Finally, we will try to obtain more compasses to allow more students to participate in the orienteering activity. The teamwork of these groups will be observed during the exercises.
GE 261 Program Outcomes Assessment Results and Action Plan

Program Outcome (h): An ability to understand the impact of engineering solutions in a global context

<table>
<thead>
<tr>
<th>Performance Indicator</th>
<th>Strategies</th>
<th>Source of Assessment</th>
<th>Assessment Method(s)</th>
<th>Time of Data Collection</th>
<th>Assessment Coordinator</th>
<th>Evaluation of Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Gains knowledge of engineered solutions specific to geological engineering</td>
<td>GE101, GE261, GE471</td>
<td>GE261</td>
<td>Lab 9, prob. 14, group exercise</td>
<td>2011</td>
<td>Darrow</td>
<td>Program Faculty</td>
</tr>
<tr>
<td>2. Extends the solution to understand an alternate global, economic, environmental, or societal context</td>
<td>GE101, GE261, GE471</td>
<td>GE261</td>
<td>Lab 11, prob. 16, 17</td>
<td>2011</td>
<td>Darrow</td>
<td>Program Faculty</td>
</tr>
<tr>
<td>3. Identifies modifications necessary to adapt to an alternate context</td>
<td>GE101, GE261, GE471</td>
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Results Spring 2010: Lectures in GE261 were refined to include more engineering solutions for given topics. The laboratory exercises were newly developed for the 2010 class, with a focus on more map reading and more geology/geohazards within Alaska. In team activities, students were asked to solve engineering problems related to certain geologic phenomena. Students provided input on pre-post course surveys on their ability “to identify solutions to geological engineering problems, and to understand the impact of these engineering solutions globally, economically, or environmentally.” On the pre-course survey, 72% indicated a modest to poor understanding with the remaining 28% indicating an adequate understanding. On the post-course survey, 4% indicated no change in their understanding (these were seniors taking this course as one of their last), 64% indicated a stronger understanding and 32% indicated a much stronger understanding.

Actions 2010: The students provided positive feedback on the lab exercises. Refinement and modifications will continue to be made to these exercises. While not specifically assessed in 2010, the tremendous increase in pre- and post-test scores indicates that the students are acquiring an understanding of the topics presented in the course.

Results Spring 2011: For the second year, the laboratory exercises developed specifically for GE261 were used, as were the team activities. On the pre-course survey, 74% of the students indicated a modest to poor understanding, 21% indicated an adequate understanding, and 5% indicated a high understanding. On the post-course survey, 5% indicated no change (these individuals were seniors taking this course in their last semester), 56% indicated a stronger understanding, and 39% indicated a much stronger understanding. Three GE and MIN students were selected for overall evaluation of Indicators 1 and 2. These three students demonstrated a Developing to Exemplary ability to understand the impact of engineering solutions in a global context.

Actions 2011: The students provided positive feedback on the lab exercises. Refinement and modifications will continue to be made to these exercises.
GE ABET PREPARATION TIMELINE

1/31/2011
Survey questions — review and approval

Mailing out alumni & employer surveys

Office visit to key employers

1/23/2011
Informing GE students PEO changes
1/27/2011

3/1/2011
Review of Fall 2010 course assessments
11:00 AM - Noon

3/3/2011
Review of Spring 2010 course assessments
11:00 AM - Noon
2/15/2011

2/27/2011

3/6/2011

3/13/2011

3/19/2011
Analysis of survey results
3/15/2011

3/24/2011
Preparation of ABET report starts

4/3/2011
Collecting faculty vita and course syllabi including geology
4/16/2011

4/10/2011

4/19/2011

5/13/2011
Spring 2011 course assessments in file and review

4/24/2011

5/1/2011

5/8/2011

5/14/2011

6/1/2011
Draft ABET report submission

5/22/2011

5/29/2011

6/5/2011
Report editing

5/15/2011

6/11/2011

6/14/2011
Final ABET report submission

6/12/2011
Report editing
6/12/2011 - 6/14/2011

6/19/2011

6/20/2011

3rd revision March 3, 2011
CRITERION 5. CURRICULUM

Program Curriculum

As stated in the previous criteria, the GE program serves as a resource for state and private development through services, research, and education. The GE program provides competent geo-engineers to employers in Alaska and elsewhere. The educational component of the program consists of three objectives with which the GE curriculum aligns:

Objective 1: Graduates will be employed in one of the following professional areas: mineral and energy exploration and development; geotechnical engineering; groundwater engineering; or geo-environmental engineering.

The emphasis is to provide GE graduates with a well-balanced education in the areas of typical activities that challenge geological engineers in Alaska. The GE curriculum requires students to complete 14 credits in fundamental engineering sciences, 15 credits in geosciences, and 43 credits of the GE program core courses including 37 credits in geological engineering and mining engineering, and 6 credits of technical electives. Among the GE and mining courses, 36 credits are upper-division courses (i.e., 300- and 400-level) with an emphasis in geotechnical engineering, groundwater, and mineral exploration and valuation. Also included are the topics of cold region-related engineering issues. Supplementary 15 credits of geosciences further improve our students’ capability in the employment areas identified in PEO #1. Upon completing this comprehensive course work, our graduates are prepared for employment in professional industries.

Objective 2: Graduates will possess technical knowledge required to meet the unique challenges of geological engineering problems germane to cold regions, especially Alaska.

Geological engineers in Alaska face unique engineering problems caused by extreme weather conditions and the presence of permafrost. Practicing engineers in Alaska must attain a certain level of readiness in order to solve problems germane to Alaska and its frigid environment. The curriculum includes 43 credits of upper-division (i.e., 300- and 400-level) GE, geology, and mining courses, through which our students gain technical knowledge pertaining to Alaska. Case studies, homework assignments, class lectures and laboratory exercises, and term projects embedded in some of the GE courses provide our students with intensive, specialized training in arctic science and engineering. Our graduates are engineering professionals who have a thorough understanding of the geological engineering issues related to Alaska.

Objective 3: Graduates will pursue life-long learning through continuing education opportunities, professional registration/certification, and/or graduate studies.

The recent alumni survey indicated that the majority of our GE graduates chose to conduct their graduate studies at UAF or other institutions full time or attend graduate school part time while working for consulting firms or government agencies. GE courses emphasize the importance of life-long learning, especially in the senior design class (GE 480 – Senior Design). Our students (including some recent graduates through personal contact) are constantly reminded of the importance of retaining technical currency by attending workshops/conferences, taking college courses, pursuing advanced degrees, or seeking professional registration/certification while
working. GE students are keenly aware that technical currency is one of the important roles for career development in professional life.

The GE curriculum is designed to provide adequate coverage of mathematics, basic sciences, engineering sciences, and general education, as well as in-depth education in the topics of geological engineering. Our graduates are competent and prepared for employment in the mineral, energy, geotechnical, and construction industries, with fundamental knowledge in solving problems germane to Alaska. Our graduates are also prepared for advanced studies at the master and doctoral levels.

The GE curriculum requires a minimum of 134 credits for graduation and comprises three major components, including (1) mathematics, basic sciences, and statistics; (2) general education; and (3) engineering sciences, geosciences, and geological engineering related topics. A summary of the program curriculum can be found in Table 5-1, and detailed course syllabi are included in Appendix A.

1. Overview of Required Courses

**Basic Sciences, Mathematics, and Statistics (34 credits):** These courses stress the scientific principles upon which the geological engineering program is based.
- CHEM 105X - General Chemistry (4 credits)
- CHEM 106X - General Chemistry (4 credits)
- MATH 200X - Calculus I (4 credits)
- MATH 201X - Calculus II (4 credits)
- MATH 202X - Calculus III (4 credits)
- MATH 302 - Differential Equations (3 credits)
- PHYS 211X - General Physics (4 credits)
- PHYS 212X - General Physics (4 credits)
- STAT 200 - Elementary Probability & Statistics (3 credits)

**General Education (28 credits):** Students fulfill the university’s core requirements for general education in two areas: communication and perspectives on the human condition. Courses from the 2010–11 catalog are listed below:

**Communication (9 credits):**
- ENGL 111X - Introduction to Academic Writing (3 credits)

Complete one of the following:
- ENGL 211X - Academic Writing about Literature (3 credits)
- ENGL 213X - Academic Writing about the Social and Natural Sciences (3 credits)

Complete one of the following:
- COMM 131X - Fundamentals of Oral Communication: Group Context (3 credits)
- COMM 141X - Fundamentals of Oral Communication: Public Context (3 credits)

**Perspectives on the Human Condition (18 credits):**
Complete all of the following four courses:
- ANTH 100X/SOC 100X - Individual, Society and Culture (3 credits)
- ECON 100X or PS 100X - Political Economy (3 credits)
- HIST 100X - Modern World History (3 credits)
- ENGL/FL 200X - World Literature (3 credits)
Complete one of the following three courses:
- ART/MUS/THR 200X - Aesthetic Appreciation: Interrelationship of Art, Drama and Music (3 credits)
- HUM 201X - Unity in the Arts (3 credits)
- ANS 202X - Aesthetic Appreciation of Alaskan Native Performance (3 credits)

Complete one of the following six courses:
- BA 323X - Business Ethics (3 credits)
- COMM 300X - Communicating Ethics (3 credits)
- JUST 300X - Ethics and Justice (3 credits)
- NRM 303X - Environmental Ethics and Actions (3 credits)
- PS 300X - Ethics and Society (3 credits)
- PHIL 322X - Ethics (3 credits)

Or 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

**Library and Information Research (0–1 credit):** Successful completion of library skills competency test or LS 100X or 101X prior to junior standing.

**Engineering Sciences (14 credits):** These courses stress fundamental engineering sciences in various areas.
- ES 201 - Computer Techniques (3 credits)
- ES 208 - Mechanics (4 credits)
- ES 331 - Mechanics of Materials (3 credits)
- ES 341 - Fluid Mechanics (4 credits)

**Geological Engineering, Geosciences, Mining Engineering, and Technical Electives (58 hours):** Core subjects for the GE program include the courses below. These courses provide students with knowledge, skills, and engineering tools to function as geological engineers upon graduation. Many courses require laboratory sessions that allow students to gain hands-on practice for engineering applications. A significant number of courses in the list contain engineering design components and provide students with opportunities to learn and design engineering projects, and derive solutions to geological engineering problems.
- GEOS 213 - Mineralogy (4 credits)
- GEOS 214 - Petrology and Petrography (4 credits)
- GEOS 322 - Stratigraphy and Sedimentation (4 credits)
- GEOS 332 - Ore Deposits and Structure (3 credits)
- GE 101 - Introduction to Geological Engineering (1 credit)
- GE 261 - General Geology for Engineers (3 credits)
- GE 365 - Geological Materials Engineering (3 credits)
- GE 375 - Principles of Engineering Geology and Terrain Analysis (3 credits)
- GE 381W - Field Methods and Applied Design I (2 credits)
- GE 382W - Field Methods and Applied Design II (4 credits)
• GE 405 - Exploration Geophysics (3 credits)
• GE 420 - Subsurface Hydrology (3 credits)
• GE 471 - Remote Sensing for Engineering (3 credits)
• GE 480W - Senior Design (3 credits)
• MIN 202 - Mine Surveying (3 credits)
• MIN 370 - Rock Mechanics (3 credits)
• MIN 408O - Mineral Valuation & Economics (3 credits)
• Technical Elective – e.g., GE 376 - GIS Applications in Geological & Environmental Engineering (3 credits; elective)
• Technical Elective – e.g., GE 440 - Slope Stability (3 credits; elective)

2. Individual Components of the Geological Engineering Curriculum

In this subsection, each component of the GE curriculum and its role in contributing to the student’s accumulated knowledge and skills are described.

**Basic Sciences, Mathematics, and Statistics (34 credits):** The mathematics component of the GE curriculum requires 15 credits of course work including Calculus I, II, III, and Differential Equations. It provides a solid foundation of mathematical knowledge. The mathematical knowledge and skills that students gain through the curriculum are adequate. The mathematics requirement by the GE program at UAF is comparable with other similar programs in the nation.

The basic science requirement includes 16 credits of course work including general college chemistry (8 credits) and general college physics (8 credits and calculus based). Both chemistry and physics requirements include a full one-year laboratory experience. One statistics course (3 credits) is required for GE students.

**General Education (28 credits):** The general degree requirements at UAF require all students to complete 28 credits of communication, perspectives on the human condition, and library and information research.

Communication skill is essential to the success of our students’ professional careers. This university core communication requirement consists of two English writing courses and one oral communication course for a total of 9 credits. In addition to these English and communication courses, the oral and written communication skills are practiced by students throughout the entire GE curriculum. Three geological engineering and one mining engineering courses are designated with W and O, respectively. The courses with W designation indicate writing-intensive courses and the one with O designation indicates an oral communication-intensive course. With these courses, students have opportunities to practice oral and written communication skills as they progress through their studies.

**Engineering Sciences (14 credits):** The engineering science courses stress fundamental engineering sciences in computer techniques, mechanics, mechanics of material, and fluid mechanics. These courses provide students with a good understanding of general engineering principles and develop a solid foundation for more specific geological engineering courses. Two of these engineering science courses (ES 201- Computer Techniques and ES 341 - Fluid Mechanics) have a strong laboratory component, providing students with opportunities for
hands-on practice and skill development. Each semester-long course has laboratory sessions. Together, one full year of laboratory experience is provided.

**Geological Engineering, Geosciences, Mining Engineering, and Technical Electives (58 hours):** A total of 28 credits of geological engineering courses and 9 credits of mining engineering courses are offered by faculty in the Department of Mining and Geological Engineering. Six credits of technical electives are offered by faculty in Geological Engineering, Mining Engineering, Petroleum Engineering, or Civil Engineering. An additional 15 credits of geology courses are offered by the Department of Geology and Geophysics. This package of 19 courses teaches our students many aspects of the geological engineering discipline from geological investigation, mineral exploration, groundwater hydrology, and soil and rock mechanics, to slope stability and arctic engineering. The integration of various aspects of geological engineering knowledge and experience that students gain through the GE curriculum is reflected in the capstone design course – GE 480.

Geological engineering and related courses can be categorized into roughly four categories as summarized below:

- **Introductory courses** include introduction to geology and geological engineering fundamentals. These courses give students a general overview of geology and geological engineering. GE 101, GE 261, GEOS 213, GEOS 214, MIN 202, ES 201, and ES 208 provide excellent opportunities to freshmen and sophomore students for geologic and engineering experience. This serves as a solid foundation for further in-depth geological engineering study.

- **Fundamental courses** contain basic knowledge that is essential to GE students and prepare them for the next level and more in-depth courses. These include mechanics of materials (ES 331), fluid mechanics (ES 341), geological materials engineering (GE 365), rock mechanics (MIN 370), terrain analysis (GE 375), field methods (GE 381 & GE 382), stratigraphy and sedimentation (GEOS 322), and ore deposits and structure (GEOS 332). These are the basic components of the GE curriculum. Several of these courses also contain hands-on field and laboratory components for students to develop skills needed as geological engineers, which include soil and rock mechanics testing and field mapping. The field methods courses are in two parts – GE 381 and GE 382. A total of 6 weeks of fieldwork are needed to complete several geological mapping projects. The courses are offered in the summer. Students gain knowledge of Alaska’s geology and how to apply geological data obtained in the field to an engineering project.

- **Core geological engineering courses** are the primary component of the geological engineering curriculum. These courses offer in-depth discussions and practice in groundwater hydrology (GE 420), remote sensing applications (GE 471), mineral economics (MIN 408), exploration geophysics (GE 405), GIS applications (GE 376), and slope stability analysis (GE 440). These are key courses for geological engineering professionals, and they provide GE students with the knowledge and contemporary skills needed to become competent engineers. These courses are built on the foundation of the previous two categories of courses and other courses in math, science, general education, and engineering science. Through the completion of these core GE courses, students will have an in-depth understanding of the geological engineering profession.
and become aware of the advancement of technology and knowledge in geological engineering, thus developing a desire for life-long learning. Many of these core GE courses have strong design components. The students are exposed to the concepts of the GE discipline and gain experience in geological engineering designs through this series of courses.

- **Senior design course** integrates previous knowledge, skills, and experiences into a major design project. The capstone senior design course (GE 480) trains students to work in teams and to provide solutions to engineering problems under the constraints that are commonly encountered by professional engineers in Alaska. The senior design course is a valuable opportunity for GE students to examine and review the knowledge and skills they have acquired in the program, and prepares them for employment in industry or for advanced study.

There are prerequisites accompanying most of the GE courses (see graph “Flowchart showing the GE curriculum prerequisites requirement). In the first year, GE 101 and GE 261 do not require any prerequisites because these two courses are fundamental GE courses. In order to build a solid foundation for a student’s education, the GE curriculum requires students to complete a set of university core courses and the two mentioned GE courses in the first year. As students progress further in their study, they are required to take several of the engineering science (ES 208) and geology courses (GEOS 213 and 214) in the second year. Some of the basic courses taken in the first year including MATH, ENGL, CHEM, and COMM become the prerequisites of ES and GEOS courses. ES 208 is the first mechanics course our students will take, and it becomes the prerequisite for all of the engineering science and GE courses directly or indirectly. In the third year, students start taking more of the GE, GEOS, and ES courses including GE 365, GE 375, GEOS 322, GEOS 332, ES 331, and ES 341. These include many of geology and engineering topics. Therefore, GE 261 is the prerequisite for GE 365 and GE 375, and ES 208 is required before taking ES 331 and ES 341. GEOS 231 and GEOS 241 are prerequisites of the two more-advanced geology courses. During summer of the third year, students are required to take field courses (i.e., GE 381 and GE 382). By this time, they should have completed the geology courses, and have a basic understanding of field geology. Six courses including four geology courses, GE 261, and ENGL 211/213 are the prerequisites for GE 381 and GE 382. In the last year of study, students are mainly involved in GE training. Included in the curriculum are GE 405, GE 420, GE 471, and GE 480, and two technical electives in GE or other fields approved by academic advisors. Many of the courses taken by students in the previous three years become the prerequisites of these GE senior courses. It is especially true that GE 480 requires students to complete all other GE courses before enrolling in the senior design class. These strict requirements assure that graduating seniors have the necessary academic training to undertake design projects, which often involve multiple subject areas.

As stated in the previous Criteria and listed in Table 5-1, the GE baccalaureate degree program requires four years plus one summer to complete. The GE curriculum is designed to meet the 12 student outcomes and PEOs, and the program’s and UAF’s mission. To successfully complete the degree, all GE students are advised to take about 16 credits each semester. Under extenuating circumstances, some students will need one or two additional semesters to finish their degrees. GE faculty are considerate and responsive to students’ requests, and help them modify their study plans to accommodate for the extra time needed.
All of the courses in the GE curriculum are semester-long with 15 contact hours per credit and 60 minutes per contact hour. Courses are offered mostly in the daytime; however, night classes are possible if there is scheduling difficulty. Lab hours are included in some of the GE courses if laboratory practices are an integral component of the courses. Three hours of lab exercise per week per semester are equivalent to one credit.

Field geology courses (i.e., GE 381 and GE 382) offered in summers take a different approach. One week (i.e., 10 hours a day and 6 to 7 days a week) of field mapping and surveying amounts to one credit. Therefore, six weeks of summer fieldwork are needed to complete GE 381 and GE 382. The distribution of time is about 4 weeks of fieldwork and 2 weeks of in-class lectures, data analysis, and report writing. At least 2 weeks of fieldwork are devoted to engineering applications.

GE students are offered many opportunities for design experience that eventually lead to a comprehensive design exercise in the senior design class. In the core GE courses, students have opportunities to practice and gain experience in groundwater hydrology, mineral exploration, slope stability, GIS applications, site evaluation, soil and rock mechanics, and engineering and mineral economics.

In senior design, students are assigned to work in teams whenever possible, sometime on a multi-disciplinary team. Students are provided with data and constraints from real or potential large-scale engineering projects, which the State of Alaska is constructing or planning to construct in the near future. This gives students an early exposure to real-world geological engineering work. The senior design course emphasizes both oral and written communication skills. In the third week of the semester, students are required to submit written proposals in response to a RFP from the instructor, and orally defend their proposals. In the last week of the semester, each team is required to give a design project presentation to the program faculty, fellow students, and professionals from industry and government agencies. The shortcomings of the projects are discussed during the presentation, and suggestions are made by the audience. The suggestions from faculty and professional engineers are included in the final senior design project report. The final report is reviewed one more time by the instructor, if time permits. The report results are sometimes reviewed by government agencies or industry for their on-going or future design projects. On occasion, some of the students will present their design projects at professional meetings and conferences.

The following are titles of student projects from 2006 to 2011. Detailed project reports from students are archived in the department’s ABET hard drive for review during the ABET visit.

- Reconnaissance Geological and Geotechnical Engineering Survey Methodology for Gas Pipeline Construction in Alaska (2008, one of the reports presented at the 2008 annual AEG meeting, p. 26)
Flowchart showing the GE curriculum prerequisites requirement.
• Preliminary Geological and Geotechnical Study of the Port MacKenzie Rail Corridor (2009)
• Construction Campsites Selection for the Alaska Gas Pipeline Project (2010)
• Nelchina Slides Remediation Analysis and Design Glenn Highway MP 138 (2011)

The GE program is a stand-alone academic unit and has no cooperative education arrangement with other institutes.

The GE department will provide reviewers with a CD containing the electronic files listed below before the campus visit, if preferred. The material will also be available for inspection by the reviewer at the time of the visit:

• 2011–2012 University of Alaska Fairbanks Catalog;
• Electronic files containing materials of each of the GE courses including assessment of individual GE courses, program outcomes assessment and action plans, lecture notes, textbooks if available, student homework, lab reports, exams if available, term papers, and design reports.
• Printed copies of assessments of individual GE courses, program outcomes assessment and action plans, and course materials and some of the student portfolios, if electronic files are not available.
• Textbooks and instructor lecture notes, if electronic files are not available.
### Table 5-1 Curriculum

Geological Engineering

<table>
<thead>
<tr>
<th>Course (Department, Number, Title)</th>
<th>Course Description</th>
<th>Indicate Whether Course is Required, Elective or a Selected Elective by an R, an E or an SE</th>
<th>Curricular Area (Credit Hours)</th>
<th>Last Two Terms the Course was Offered: Year and Semester or Quarter</th>
<th>Average Section Enrollment for the Last Two Terms the Course was Offered</th>
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<tr>
<td>1st Year Fall Semester</td>
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<td>GE 101- Introduction to Geological Engineering</td>
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<td>ENGL 211X or 213X - Academic Writing</td>
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<td>Semester</td>
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<td>Credit</td>
<td>Units</td>
<td>Offered</td>
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<td>2nd</td>
<td>Spring</td>
<td>ES 201 - Computer Techniques</td>
<td>R</td>
<td>3 (   )</td>
<td>F2011 &amp; S2011</td>
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<td>PHYS 212X - General Physics</td>
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<td>F2010 &amp; S2011</td>
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<td>GEOS 214 - Petrology and Petrography</td>
<td>R</td>
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<td>3rd</td>
<td>Fall</td>
<td>ES 331 - Mechanics of Materials</td>
<td>R</td>
<td>3 (   )</td>
<td>F2010 &amp; S2011</td>
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<td></td>
<td></td>
<td>GE 375 - Principles of Engineering Geology &amp; Terrain Analysis</td>
<td>R</td>
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<td>3rd</td>
<td>Spring</td>
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<td>4 (   )</td>
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<td></td>
<td></td>
<td>GEOS 332 - Ore Deposits &amp; Structure</td>
<td>R</td>
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<td></td>
<td></td>
<td>MIN 370 - Rock Mechanics</td>
<td>R</td>
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<td></td>
<td></td>
<td>GEOS 322 - Stratigraphy and Sedimentation</td>
<td>R</td>
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<td>SE</td>
<td>(   )</td>
<td>F2010 &amp; S2011</td>
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<td>Summer</td>
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<td>GE 382 - Field Methods and Applied Design II</td>
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<td>GE 405 - Exploration Geophysics</td>
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<td>Technical Electives (e.g. GE 440 - Slope Stability)</td>
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<td>MIN 408 - Mineral Valuation &amp; Economics</td>
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<td>Technical Electives (e.g. GE 376 - GIS Applications in Geological &amp; Environmental Engineering)</td>
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<td>S2010</td>
</tr>
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<td></td>
<td></td>
<td>Perspectives on the Human Condition</td>
<td>SE</td>
<td>(   )</td>
<td>F 2010 &amp; S2011</td>
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<td>TOTALS-ABET BASIC-LEVEL REQUIREMENTS</td>
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<td>28</td>
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<tr>
<td>OVERALL TOTAL CREDIT HOURS FOR THE DEGREE</td>
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<td>PERCENT OF TOTAL</td>
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<td>42.5%</td>
<td>20.9%</td>
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<table>
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<tr>
<th>Total must satisfy either credit hours or percentage</th>
<th>Minimum Semester Credit Hours</th>
<th>Minimum Percentage</th>
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<tbody>
<tr>
<td></td>
<td>32 Hours</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>48 Hours</td>
<td>37.5%</td>
</tr>
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</table>

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.

Instructional materials and student work verifying compliance with ABET criteria for the categories indicated above will be required during the campus visit.
Course Syllabi

Appendix A includes the following syllabi;

- GE 101 - Introduction to Geological Engineering (1 credit)
- GE 261 - General Geology for Engineers (3 credits)
- GE 365 - Geological Materials Engineering (3 credits)
- GE 375 - Principles of Engineering Geology and Terrain Analysis (3 credits)
- GE 376 - GIS Applications in Geological & Environmental Engineering (3 credits; elective)
- GE 381 - 382W - Field Methods and Applied Design I & II (2 & 4 credits)
- GE 405 - Exploration Geophysics (3 credits)
- GE 420 - Subsurface Hydrology (3 credits)
- GE 440 - Slope Stability (3 credits; elective)
- GE 471 - Remote Sensing for Engineering (3 credits)
- GE 480W - Senior Design (3 credits)
- GEOS 213 - Mineralogy (4 credits)
- GEOS 214 - Petrology and Petrography (4 credits)
- GEOS 322 - Stratigraphy and Sedimentation (4 credits)
- GEOS 332 - Ore Deposits and Structure (3 credits)
- MIN 202 - Mine Surveying (3 credits)
- MIN 370 - Rock Mechanics (3 credits)
- MIN 408O - Mineral Valuation & Economics (3 Credits)
- ES 201 - Computer Techniques (3 credits)
- ES 208 - Mechanics (4 credits)
- ES 331 - Mechanics of Materials (3 credits)
- ES 341 - Fluid Mechanics (4 credits)
- CHEM 105X - General Chemistry (4 credits)
- CHEM 106X - General Chemistry (4 credits)
- PHYS 211X - General Physics (4 credits)
- PHYS 212X - General Physics (4 credits)
- MATH 200X - Calculus I (4 credits)
- MATH 201X - Calculus II (4 credits)
- MATH 202X - Calculus III (4 credits)
- MATH 302 - Differential Equations (3 credits)
CRITERION 6. FACULTY

A. Faculty Qualifications

The GE program is fully staffed with four full-time faculty positions. The faculty size of four in the GE program has been steady over the past decade. One tenure-track assistant professor, Dr. Margaret M. Darrow, joined the program in January 2008. Dr. Debasmita Misra, a tenured, associate professor, joined the program in January 2002. The other two faculty members are tenured, full professors. Dr. Scott Huang was hired in August 1981. Dr. Paul Metz started working at UAF in 1975 and joined the GE program in 1984.

GE faculty have a wide range of industrial and academic expertise in areas such as geophysical exploration, mineral economics, soil and rock mechanics, slope stability, geomechanical and geotechnical engineering, terrain analysis and site selection, GIS applications, groundwater hydrology, geo-environmental engineering, remote sensing, and arctic engineering.

All faculty members have Ph.D. degrees in geological engineering or related disciplines and are well-qualified, highly motivated professionals. Table 6-1 lists the qualifications of each faculty.

Dr. Huang is responsible for teaching the capstone design course (GE 480 – Senior Design), one of the GE technical engineering courses (GE 440 – Slope Stability), GE 405 – Exploration Geophysics, and ES 208 – Mechanics. Though not on a regular basis, he also teaches GE 101 – Introduction to Geological Engineering and GE 381 – Field Methods and Applied Design I.

Dr. Debasmita Misra is responsible for GE 101 – Introduction to Geological Engineering, GE 420 – Subsurface Hydrology, GE 471 – Remote Sensing for Engineering, and ES 210 – Dynamics. He also has taught a groundwater hydrology course at the graduate level.

Dr. Margaret M. Darrow teaches the rest of the GE courses including GE 261 – General Geology for Engineers, GE 365 – Geological Materials Engineering, GE 375 – Principles of Engineering Geology and Terrain Analysis, and one of the technical courses (GE 376 – GIS Applications in Geological & Environmental Engineering). She is the main person responsible for coordinating and teaching GE 381 and GE 382 – Field Methods and Applied Design I and II. On a less frequent basis, she has taught ES 209 – Statics.

Dr. Paul Metz has bought out his teaching duty since the 2009–10 fiscal year and, currently, is not responsible for any courses.

Faculty of the GE program are widely diverse in expertise and experience, which makes it easy to cover the curricular areas of the program. Areas of expertise are summarized in the following table. GE faculty are actively involved in externally funded research. Their research and subsequent publications not only add to the body of technical knowledge in various subject areas, but also enhance the quality of instruction and the prestige of the university.
Areas of Expertise of the Geological Engineering Faculty

<table>
<thead>
<tr>
<th>Name</th>
<th>Areas of Expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Margaret M. Darrow</td>
<td>Soil mechanics, frozen ground engineering, frost heave, soil physics, and thermal modeling of embankments</td>
</tr>
<tr>
<td>Scott Huang,</td>
<td>Slope stability, soil and rock mechanics, arctic engineering, gas pipeline engineering, and geophysical exploration</td>
</tr>
<tr>
<td>Paul Metz,</td>
<td>Mineral exploration, valuation, and economics, terrain analysis and site selection, geomaterial engineering</td>
</tr>
<tr>
<td>Debasmita Misra,</td>
<td>Numerical modeling, geostatistics, groundwater hydrology, geo-environmental engineering</td>
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</table>

B. Faculty Workload

Per faculty contract, each of the GE faculty is required to teach two courses (i.e., usually 6 credits) per semester for a total of 12 credits per contract year. Occasionally, one or two additional credits might be added to a faculty’s teaching because of the nature of 4-credit courses. Teaching together with graduate student advising amounts to a 55% to 60% workload. Summer teaching of GE 381 and GE 382 can be either part of a faculty’s regular workload or an overload with extra compensation, if the instructor has already had 12 credits assigned to him/her for the 9-month contract. Research, including funded and unfunded projects, and proposal, report, and paper writing usually account for 30% to 35% of the workload. The remaining 10% to 15% of a faculty’s workload is for services including university, professional, and public services. Table 6-2 summarizes the distribution of the tripartite workload in teaching, research, and services.

C. Faculty Size

The GE program has four full-time faculty positions, which has remained steady over the past decade. Ten required GE courses and two technical electives constitute the program’s core courses, which are shared between three faculty members annually with Dr. Metz buying out his teaching duty. The current faculty size is adequate to handle the number of required and technical elective courses, if the electives are offered in alternate years.

Each student who declares a major in geological engineering is assigned an advisor from the GE program. The faculty provide assistance to students in their progress through undergraduate study, and provide input regarding career opportunities, summer employment, and graduate study in engineering. In current years, the GE faculty-to-student ratio has been about 1:11, allowing for close interaction. Faculty are familiar with most students’ academic performance and personal issues, making advising very effective.

GE faculty are intensively involved in the activities of professional organizations, including the Association of Engineering Geologists (AEG), American Rock Mechanics Association (ARMA), Alaska Miners Association (AMA), American Society of Agricultural and Biological Engineers (ASABE), American Geophysical Union (AGU), and American Water Resources Association.
AWRA). GE faculty are engaged in the activities of local mining and geotechnical industries. Several of the faculty members are concurrently organizing the 2011 Annual AEG Meeting and the 2011 International Conference “International Symposium on Erosion and Landscape Evolution” in Anchorage. GE faculty help organize the Alaska Miners Association (AMA) annual meetings, participate in and give presentations at AMA weekly and annual meetings, and are involved in other activities outside of Alaska.

The GE faculty interact well with industries and government agencies; they also work closely with industries (oil and gas, mining, geotechnical engineering, railroad, and the Alaska Department of Transportation and Public Facilities) through research projects and services. Some of the faculty members are involved in consulting for the mineral and geotechnical industry in Alaska and in foreign countries.

Although academic programs at CEM do not have explicit travel budgets for faculty professional development, travel funding is made available through overhead return to individual faculty, from the Dean’s office and INE as travel awards, faculty research funds, and the UAF Faculty Development Office. Alaska EPSCoR also provides travel funding to faculty in response to faculty-generated proposals. Even with a limited travel budget from the state-allocated fund, all GE faculty members have managed to attend professional conferences, meetings, workshops, or refresher courses at least once a year in the last few years.

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 rural campuses if requested. 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.

In general, while there are many on-campus training opportunities, professional development activities such as attending conferences and short courses can be difficult due to a 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 buy-outs, and collegial generosity.

Most professional development activities are funded by the CEM Dean’s office and INE. The travel award program provides around $2,000 for domestic travel and $2,200 to $2,500 for international travel. The award program through the Dean’s office funds travel for activities of purely academic interest such as ABET conferences and teaching workshops, while the research
program through INE funds travel for activities that develop proposals, conduct research, and disseminate results. Given the remote location of Alaska, traveling outside of the state is expensive, and travel awards are often insufficient.

E. Authority and Responsibility of Faculty

GE faculty have control over program curriculum and course-related matters such as creation, modification, and evaluation. As well, GE faculty have developed the program assessment plan and educational objectives without interference from the administration. However, academic procedures require faculty to submit proposed plans for approval by the Department Chair, CEM Curriculum Council, CEM Dean, Curriculum Council of the Faculty Senate, and the Provost.

Each individual with signatory authority bears the same responsibility: to ensure that course proposals can be executed effectively and efficiently. The department chair ensures that the course is consistent with the mission and educational objectives of the program, and that resources (faculty time, classroom and lab equipment and space, etc.) exist to deliver the course effectively. The CEM Curriculum Council ensures that there is no course duplication within the college, while the Curriculum Council of the Faculty Senate does the same for the entire university, though it also ensures compliance with Faculty Senate and university-wide guidelines on course content and assessment. The CEM Dean, who offers guidance in curriculum development to both the department and college Curriculum Council regarding realistic constraints of course enrollment numbers, program faculty capacity, and number of courses in the degree program, must agree with the proposal in order for it to go forward.

College faculty also 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, and change can be initiated by CEM faculty at any time, but changes are subject to an approval by vote of the faculty. The same Unit Criteria are used in pre-tenure (mandatory fourth-year evaluations) and post-tenure evaluations of faculty. Unit Criteria are additional to the criteria outlined in the UAF “Blue Book” polices and regulations.
Table 6-1. Faculty Qualifications
Geological Engineering

<table>
<thead>
<tr>
<th>Faculty Name</th>
<th>Highest Degree Earned-Field and Year</th>
<th>Rank 1</th>
<th>Type of Academic Appointment 2</th>
<th>Years of Experience</th>
<th>Professional Registration/ Certification</th>
<th>Level of Activity H, M, or L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Margaret M. Darrow</td>
<td>Ph.D. – Arctic Engineering, 2007</td>
<td>Assistant Professor</td>
<td>TT FT</td>
<td>5 3.5 3.5 N/A</td>
<td>AEG, ASCE, TBP, PKP (high)</td>
<td>high low</td>
</tr>
<tr>
<td>Scott Huang</td>
<td>Ph.D. – Geological Engineering, 1981</td>
<td>Professor</td>
<td>T FT</td>
<td>0.5 30 30 N/A</td>
<td>AEG, ARMA, AMA (med)</td>
<td>med med</td>
</tr>
<tr>
<td>Paul Metz</td>
<td>Ph.D. – Mining Geology, 1991</td>
<td>Professor</td>
<td>T FT</td>
<td>6 26 35 CPG</td>
<td>AEG, SME (high)</td>
<td>med med</td>
</tr>
<tr>
<td>Debasmita Misra</td>
<td>Ph.D. - Biosystems and Agricultural Engineering, 1994</td>
<td>Associate Professor</td>
<td>T FT</td>
<td>4 13 11 N/A</td>
<td>AEG, AGU, ASABE, AWRA (med-high)</td>
<td>med-high none</td>
</tr>
</tbody>
</table>

Instructions: Complete table for each member of the faculty in the program. Add additional rows or use additional sheets if necessary. Updated information is to be provided at the time of the visit.

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, should reflect an average over the year prior to the visit plus the two previous years.
4. At the institution
<table>
<thead>
<tr>
<th>Faculty Member</th>
<th>PT or FT</th>
<th>Classes Taught (Course No./Credit Hrs.) Term and Year</th>
<th>Program Activity Distribution</th>
<th>% of Time Devoted to the Program</th>
</tr>
</thead>
</table>
| Margaret M. Darrow    | FT       | Fall 2010
GE 365 (3 cr); GE 375 (3 cr)
Spring 2011
GE 261 (3 cr); ES 209 (3 cr) | 53.4% 33.3% 13.3% | 100% |
| Scott Huang           | FT       | Summer 2010
GE 381 (2 cr)
Fall 2010
GE 405 (3 cr); ES 208 (4 cr)
Spring 2011
GE 480 (3 cr) | 60.0% 26.7% 13.3% | 100% |
| Paul Metz             | FT       | Buy-out; No class teaching | 16.6% 73.3% 10% | 100% |
| Debasmita Misra       | FT       | Fall 2010
GE 420 (3 cr); GE 471 (3 cr)
Spring 2010
GE 322 (3 cr); ES 210 (3 cr) | 63.3% 26.7% 10% | 100% |

1. FT = Full Time Faculty or PT = Part Time Faculty, at the institution
2. For 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.
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 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 spaces. The building is home to all seven engineering programs and four different research units under the Institute of Northern Engineering. Given the recent enrollment trends and growing research activities, space is becoming an 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 on campus are scheduled by UAF Academic Scheduling in the Registrar’s Office. Most engineering classes are taught in the Duckering Building, where there are a total of 9 general-purpose classrooms controlled by Academic Scheduling, with a total classroom area of 6568 ft². These nine classrooms are all classified as “smart” classrooms, in that LCD projectors with laptop/tablet computer connections are available. Some 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. Whiteboards are used in all classrooms. A couple of “Smart Carts” are also available; they include a computer with wireless Internet connectivity and an LCD projector on a mobile cart.

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 in Duckering are equipped with “smart” technology, several with Tandberg videoconferencing capability.

Space in Duckering dedicated to the GE program includes offices for the office manager (shared with the Mining Engineering program) and for the four GE faculty members, and a departmental conference room. Teaching assistants are provided space through a central college-wide TA office space pool. The GE program is provided with one or two teaching assistants every year.

The GE program allows students to have routine exposure to hands-on activities in the geological engineering and mining laboratories as well as in the computer labs. These instructional laboratories are available to GE students and those students taking courses from the program. All the computer labs in the Department of Mining and Geological Engineering are shared by both programs.

Brief descriptions of the geological engineering labs and several of the mining labs are given below. The table “Laboratory facilities in the GE Program” summarizes the laboratory sizes and locations, as well as the courses taught in those labs. A more-detailed description of each lab is included in Appendix C.
Geological Engineering Laboratories: Descriptions of a number of GE program-specific labs in the Department of Mining and Geological Engineering, also available to mining students taking courses or conducting class-related projects, are as follows:

- **General Computer Lab (also used for GIS and Remote Sensing courses)** is a multipurpose lab used by all students of the Department of Mining and Geological Engineering. A network of 11 PC computers is linked to the UAF domain. Software packages are available for word processing, drawing, and the Internet. The lab is also used by students in GE 376, GE 420, GE 440, and GE 471 that require the use of software packages specific to certain areas such as ArcGIS, Visual Modflow 4.3, gINT, ERMapper, MATLAB, Vulcan 8.0, Rockware, WinGEM2, Res2d, and Geo-Studio.

- **General Geology for Engineers Lab** 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 recognize the landforms associated with each of the major geologic processes. The laboratory exercises emphasize landforms in Alaska. The laboratory space is shared with GE 375 and GE 405. The existing space is adequate for only 16 students. With increasing enrollments, three laboratory sections have been needed to accommodate students. If a teaching assistant is not available, the instructor is burdened with an excessive workload.

- **Geomaterial Lab** is used to teach geological engineering students basic soils engineering. Laboratory equipment available to perform testing includes moisture content, sieve analysis, hydrometer analysis, Atterberg limits, standard and modified Proctor compaction, falling and constant head permeability, direct shear, and consolidation testing. Field equipment for soil sampling is also available. This small laboratory space also is used for research purposes. In recent years, class sizes have necessitated dividing the class into two laboratory sections, as the small room cannot accommodate the entire class at once. If a teaching assistant is not available, the instructor is burdened with an excessive workload.

- **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 Lab** is used to train students on various types of geophysical equipment. The lab functions are in part completed in the field, depending on weather conditions. The preparation of laboratory work is conducted in the lab. The lab exercises entail review of the operating procedures for the equipment and reduction of data collected in the field. Lab projects are designed based on the equipment available. The major pieces of equipment utilized in the field surveys include a Seistronix RAS-24 seismograph, a DC Electric Resistivity Syscal Pro unit, a GPR SIRveyor SIR-20, and a Frequency Domain EM GEM-2 unit.

- **Rock Mechanics Lab** is used to conduct experiments and tests on rock and frozen soil samples under various environmental conditions. This lab is used for both teaching and research purposes. The major pieces of equipment in the lab include computerized direct shear test apparatus, computerized compressive testing machine (330,000 lb capacity), computerized compressive testing machine (55,000 lb capacity), triaxial test cells,
environmental chamber with Cincinnati sub-zero refrigeration system (range -85°F to +180°F, and relative humidity 20% to 90%), computerized data acquisition/processing system, transmission polariscope, reflection polariscope, 10-channel portable strain indicator, triaxial hydraulic loading frame, point-load tester, flat jack, tape extensometer, rock bolt pull tester, 16-channel data loggers (2), inclinometer and settlement reader, tilt meter, MiniMate Plus seismograph, crack meter, tissue meter, pressure cell, vibrating wire stress meter, borehole extensometer with 3 anchors, magnetic probe extensometer, creep testing machine, upgrade of computer control/data acquisition system for compressive testing machine (330,000 lb capacity), ultrasonic pulse velocity testing system, and ultrasonic tomography testing system.

- **Rock Drilling and Rock Core Preparation Lab** is primarily used to prepare specimens for testing and experiments conducted in the Rock Mechanics Lab. The lab includes two rock-coring machines, two rock saws, a rock surface grinding machine, and sensors and data loggers for drilling torque, penetration rate, and thrust.

- **Mine Surveying Lab** 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 the GE and Mining programs. The major pieces of equipment include total stations, digital theodolites, transits, EDMs, and GPS systems. Some of the equipment was upgraded in 2010.

- **Summer Field Methods Equipment:** As with the geophysical equipment, the space designated for the lab is for storage of field equipment. As taught since 2009, GE 381 and GE 382 require students to spend up to 10 days in the field, without the luxuries of beds and showers. Camping requires certain equipment that many of the students do not possess and would place them in financial hardship to acquire just for this course. It is also difficult to process the data acquired for a given day in a personal tent that may be shared by another individual. In 2009, the department purchased two wall tents to serve as a cook tent and as a workspace for the students. The equipment also includes cots, stools, and work tables for use inside the wall tent, stoves for food preparation, water containers, a generator for power at remote sites, and other miscellaneous equipment necessary for camping. Additionally, the department purchased 15 Brunton compasses and 10 rock hammers for loan to the students.

- **Mining and GE Design Laboratory** is a shared computer design lab, consisting of a network of 5 Dell Optiplex 760 Intel Duo CPU 3.32 GHz computers, each with a 30-inch monitor, and is dedicated for the Geological and Mining Engineering students who wish to use specific design software for their design projects during their senior year. The major software includes VULCAN 7.5, ArcGIS 9.2, MATLAB, GEorient, RockPack, and MS Visual Studio 2008.

- **Computer Lab of the College of Engineering and Mines – SOECAL** is a general-purpose computer lab maintained by CEM and shared by all engineering programs. It is also available to GE students taking ES 201 – Computer Techniques.

**B. Computing Resources**

GE students have access to three computer laboratories 24/7: the department computer laboratory (DUCK 310), the Design Laboratory (DUCK 318), and the SOECAL (Students of Engineering Computer Applications Lab) laboratory (DUCK 530/532). Each of these laboratories has modern
## Laboratory Facilities in the GE Program

<table>
<thead>
<tr>
<th>Laboratory</th>
<th>Functions of Laboratory</th>
<th>Courses Taught</th>
<th>Physical Location</th>
<th>Area (ft²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Computer Lab</td>
<td>A multipurpose lab used by all students of the department</td>
<td>Various MIN &amp; GE courses</td>
<td>310 Duckering Building</td>
<td>481</td>
</tr>
<tr>
<td>General Geology for Engineers Lab</td>
<td>Mineral and rock identification, topographic and geologic map reading, and airphoto interpretation</td>
<td>GE 261</td>
<td>312 and 316 Duckering Building</td>
<td>1,080</td>
</tr>
<tr>
<td>Geomaterial Laboratory</td>
<td>Geological materials engineering</td>
<td>GE 365</td>
<td>122 Duckering Building</td>
<td>383</td>
</tr>
<tr>
<td>GIS Lab</td>
<td>GIS application to geological and mining engineering</td>
<td>GE 376</td>
<td>310 Duckering Building</td>
<td>481</td>
</tr>
<tr>
<td>Exploration Geophysics Lab</td>
<td>Teaching and storage space for the geophysics field equipment</td>
<td>GE 405</td>
<td>312 and 316 Duckering Building</td>
<td>1,080</td>
</tr>
<tr>
<td>Summer Field Methods Equipment</td>
<td>Storage space for field equipment</td>
<td>GE 381/382</td>
<td>312 Duckering Building</td>
<td>366</td>
</tr>
<tr>
<td>Subsurface hydrology Lab</td>
<td>Subsurface groundwater hydrology experiments</td>
<td>GE 420</td>
<td>416 Duckering Building</td>
<td>714</td>
</tr>
<tr>
<td>Remote Sensing Lab</td>
<td>Satellite image processing for geological engineering</td>
<td>GE 471</td>
<td>310 Duckering Building</td>
<td>481</td>
</tr>
<tr>
<td>Mine Surveying Lab</td>
<td>Storage of various surveying equipment</td>
<td>MIN 202</td>
<td>356 Duckering Building</td>
<td>191</td>
</tr>
<tr>
<td>Rock Mechanics Lab</td>
<td>Rock mechanics testing and experiments</td>
<td>MIN 370, MIN 472 &amp; MIN 443</td>
<td>149A Duckering Building</td>
<td>427</td>
</tr>
<tr>
<td>Rock Drilling and Core Preparation Lab</td>
<td>Drilling tests and experiments and rock sample preparation</td>
<td>MIN 370, MIN 472 &amp; MIN 443</td>
<td>141 Duckering Building</td>
<td>598</td>
</tr>
<tr>
<td>Mining and GE Design Lab</td>
<td>Computer-aided mine designs</td>
<td>GE 480, MIN 481, MIN 482 &amp; MIN 490W</td>
<td>318 Duckering Building</td>
<td>292</td>
</tr>
</tbody>
</table>
computers and basic software such as MS Office. The department computer laboratory has specialized software including ArcGIS, Visual Modflow 4.3, gINT, ERMapper, MATLAB, Vulcan 8.0, Rockware, WinGEM2, aRes2d, Grapher, and GeoStudio. The lab is shared by students in GE 376, GE 420, GE 440, and GE 471. The Design Lab is for students who require the use of software packages specific to certain areas such as VULCAN, RockWare, Costmine, Isatis, NeuroShell, Matlab, GEorient, and RockPack. The SOECAL lab is configured for teaching with an instructor computer station, an LCD projector, whiteboard, and 26 student computer stations. Some engineering courses are scheduled in Duckering 530, including ES 201 – Computer Techniques, and others 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 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. Computational resources in terms of hardware, software, and licenses are adequate.

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. Additionally, lab staff help students and faculty create websites accessible to disabled persons.
- The Blackboard system hosts online content for courses that are suitable for both synchronous and asynchronous teaching. Features of the system include the ability to post teaching material in a variety of formats, testing, discussion boards, live whiteboard and chat room, 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.
- Supercomputing center, though it is rarely used for teaching. Faculty use this more for research. The required FBI security check prior to getting an account makes it very difficult to use this center for class. Recent developments (steep cuts in funding) make its use uncertain in the future.

C. Guidance

Faculty and staff are available to guide students as they utilize various resources. Faculty and teaching assistants train the students in specialized software and equipment such as geophysical exploration equipment, slope design software, groundwater simulation software, and others. Additionally, UAF rules require online internal safety training (provided for free) for hazardous activities such as handling chemicals in labs. Technical staff are also available to provide help with basic skills such as computing and email.
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 Chair works with the CEM Dean to get these requests funded. UAF and CEM have annual programs for funding of laboratory upgrades. The GE program has received adequate funding to upgrade its labs. As a case in point, three of the four major pieces of geophysical exploration equipment in use today were purchased after 2005. In each of the lab plans in Appendix C, faculty have outlined equipment upgrade and replacement since the last ABET in 2005.

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 method 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, 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. Off-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 below. 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, covering 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 your 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.
- Interlibrary Loan – Borrow material from other libraries.
- Instruction – Whether student, faculty, or staff, instruction for using library resources.
- Media Services – Borrow media equipment such as digital cameras, camcorders, laptops, and more. Popular and reference DVDs and CDs are available for check out.
- 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 with library research.
- Reserves – Reading materials for specified classes.
- Room Scheduling – Reserve rooms for study sessions, group meetings, conferences, and teaching.

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 ebooks. A log-in is required from both on and off campus.

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. |
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, and trucks used to deliver the program. Safety protocols and standards are developed as necessary. Field training is an integral component of the GE education. Before a field survey is conducted, the instructor
reviews the operational procedures of equipment with students. Special instructions related to communication, vehicle safety, driving conditions, natural environment, wild animals, and cold weather hazards are emphasized.

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 college 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 GE program does not have a leader per se. The academic content of the program is governed by all GE faculty. The needs and quality of the program are discussed frequently among the faculty. Any concerns needing the decision of upper administrators are brought to the attention of the department chair, currently Dr. Rajive Ganguli. All decisions related to program curriculum, assessments, objectives, and course content are made jointly, though they have to be approved by the department chair and university administration. The program has a coordinator, currently Dr. Scott Huang, who is charged to coordinate the accreditation process. The administration of the program is managed by the department chair, who coordinates a variety of program-related business including teaching assignments of faculty, course offerings, and financial aspects of the program such as funds for labs and classroom supplies.

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:

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 will also convey 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. Keep the dean informed 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 program expenditures over the past five years.

Table 8.B-1. Program Academic Year Expenditures

<table>
<thead>
<tr>
<th>Budget Category</th>
<th>AY06-07</th>
<th>AY07-08</th>
<th>AY08-09</th>
<th>AY09-10</th>
<th>AY10-11</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commodities</td>
<td>7,561</td>
<td>8,853</td>
<td>21,871</td>
<td>2,696</td>
<td>11,132</td>
<td>52,114</td>
</tr>
<tr>
<td>Contractual Services</td>
<td>6,994</td>
<td>8,968</td>
<td>11,226</td>
<td>7,040</td>
<td>9,131</td>
<td>43,360</td>
</tr>
<tr>
<td>Equipment</td>
<td>11,988</td>
<td>25,000</td>
<td>0</td>
<td>0</td>
<td>43,457</td>
<td>80,445</td>
</tr>
<tr>
<td>Travel</td>
<td>17,944</td>
<td>10,798</td>
<td>24,546</td>
<td>17,530</td>
<td>18,270</td>
<td>89,087</td>
</tr>
</tbody>
</table>

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

The budget for the GE program, which consists of fixed and discretionary components, is supported only by the State of Alaska. Fixed components are the salaries for four GE faculty and one-half of salary for the shared department administrative manager. The discretionary budget consists of services and supplies, travel, and ad hoc items. The discretionary amount allocated to the program depends on the CEM budget. UAF follows the “incremental” budget process (i.e., the budget for a given year is based on the previous year’s budget). The Provost’s office adjusts the base budget for CEM up or down, based on the fiscal situation. Additionally, CEM may receive (or be penalized) funding based on performance-based budget metrics. Ultimately, CEM adjusts the discretionary portion of the program budget based on the budget it receives. Under the discretionary category, services and supplies are funded at around $10,000 annually. These funds go towards routine needs such as phone services and tolls, office supplies, lab consumables, and software licenses. The teaching assistant position is also funded depending on the size of the lab. The GE program has received between one and two TAs each year for the last five years. Travel funding is not always provided; when it is provided, it is around $1,000–$1,500 per faculty. The ad hoc portion of the discretionary budget is based on special opportunities and needs. The program may receive ad hoc funds based on one-time UAF/CEM initiatives or salary savings from open positions and salary buy-out. Ad hoc funds from the buy-out could be large including $24,000 for lab upgrade, truck maintenance, and software licensing; $28,000 for faculty travel; and $5,000 for a visitor program since 2009.

In addition to the above-mentioned funds, other funds such as privately established endowments or donations from oil companies may be used to enhance a component of the program. 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 AEG Annual Meeting and scholarships for summer field camp.

• Donations from BP in 2009: The GE program received a gift of $8,000 for program enrichment and $5,000 for a scholarship.

• ConocoPhillips Endowment: In 2010, ConocoPhillips donated $650,000 to support the summer field camp for the GE and Geosciences programs.

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 CEM, 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, the research arm of CEM, has several dedicated technicians and administrative personnel that are also available 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 of CEM to hire. Once permission is received, a search committee is set up 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 reviews of the resumes and qualifications, telephone interviews, 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 salary typically conforms with the Oklahoma State University salary survey.
Retention strategies for new faculty include targeted start-up funds, enabling the new faculty to develop a successful research program early in his/her UAF career. Additionally, reduced teaching loads are offered in the first one to two years, along with reduced service workload. A new faculty is assigned, or may choose, a faculty mentor, typically in the same department or program, 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 program plan for rearrangement of course offerings and teaching assignments due to the absence. The faculty receives 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, it 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 buy-outs have allowed the department to fund travel internally. Though GE faculty have been able to undertake professional development activities and have remained technically current, the long-term outlook is uncertain.
PROGRAM CRITERIA

As described in previous criteria, the GE program has met its program criteria successfully. The GE program at UAF has a balanced curriculum, which applies mathematics and science fundamentals to geological engineering-related problems. The program consists of a group of faculty with expertise in diverse areas such as geomaterial/geotechnical engineering, slope stability, groundwater hydrology, mineral exploration and development, and GIS applications. Our students have rigorous training in geology, engineering sciences, and core subjects in geological engineering.

The following sections summarize the strength of the GE curriculum at UAF.

1) *The ability to apply mathematics including differential equations, calculus-based physics, and chemistry, to geological engineering problems* - Mathematics and sciences courses in the GE 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)

2) *Proficiency in geological science topics that emphasize geologic processes and the identification of minerals and rocks* - Students are required to take a sequence of geology courses offered by the Geological Engineering program and the Department of Geology and Geophysics starting their freshman year.
   - GE 261 - General Geology for Engineers (3 credits)
   - GEOS 213 - Mineralogy (4 credits)
   - GEOS 214 - Petrology and Petrography (4 credits)
   - GEOS 332 - Ore Deposits and Structure (3 credits)
   - GEOS 322 - Stratigraphy and Sedimentation (4 credits)

3) *The ability to visualize and solve geological problems in three and four dimensions* - Our students have ample opportunities to acquire their skills and improve their abilities to conceptualize geological and geological engineering problems in 3D space- and 3D+time domain. Spatial-temporal variations of geo-materials are often discussed in many of the courses. A number of courses taken by students provide such training.
   - GEOS 332 - Ore Deposits and Structure (3 credits)
   - GE 375 - Principles of Engineering Geology and Terrain Analysis (3 credits)
   - GE 381W - Field Methods and Applied Design I (2 credits)
   - GE 382W - Field Methods and Applied Design II (4 credits)
   - GE 405 - Exploration Geophysics (3 credits)
   - GE 420 - Subsurface Hydrology (3 credits)
   - GE 471 - Remote Sensing for Engineering (3 credits)
GE 480W - Senior Design (3 credits)
MIN 202 - Mine Surveying (3 credits)
GE440 - Slope Stability (3 credits; elective)
GE 376 - GIS Applications in Geological & Environmental Engineering (3 credits; elective)

4) **Proficiency in the engineering sciences including statics, properties/strength of materials, and geomechanics** - The fundamentals of engineering sciences and geomechanics are taught in the basic ES courses and several of the geological engineering and mining engineering courses.
   - ES 201 - Computer Techniques (3 credits)
   - ES 208 - Mechanics (4 credits)
   - ES 331 - Mechanics of Materials (3 credits)
   - ES 341 - Fluid Mechanics (4 credits)
   - GE 365 - Geological Materials Engineering (3 credits)
   - MIN 370 - Rock Mechanics (3 credits)

5) **The ability to apply principles of geology, elements of geophysics, geological and engineering field methods** - Three courses specifically designed to meet this criterion are listed below. The field methods courses are in two parts that most GE students take in the third summer of the study.
   - GE 381W - Field Methods and Applied Design I (2 credits)
   - GE 382W - Field Methods and Applied Design II (4 credits)
   - GE 405 - Exploration Geophysics (3 credits)

6) **Engineering knowledge to design solutions to geological engineering problems, which will include one or more of the following considerations: the distribution of physical and chemical properties of earth materials, including surface water, ground water (hydrology), and fluid hydrocarbons; the effects of surface and near-surface natural processes; the impacts of construction projects; the impacts of exploration, development, and extraction of natural resources, and consequent remediation; disposal of wastes; and other activities of society on these materials and processes, as appropriate to the program objectives**- Our students integrate their knowledge of mathematics, science, and engineering fundamentals into design and solutions to geological engineering problems through the following avenues:
   - GE 375 - Principles of Engineering Geology and Terrain Analysis (3 credits)
   - GE 381W - Field Methods and Applied Design I (2 credits)
   - GE 382W - Field Methods and Applied Design II (4 credits)
   - GE 405 - Exploration Geophysics (4 credits)
   - GE 420 - Subsurface Hydrology (3 credits)
   - GE 471 - Remote Sensing for Engineering (3 credits)
   - GE 480W - Senior Design (3 credits)
   - GE440 - Slope Stability (3 credits; elective)
   - GE 376 - GIS Applications in Geological & Environmental Engineering (3 credits; elective)
   - MIN 370 - Rock Mechanics (3 credits)
   - MIN 408 - Mineral Valuation & Economics (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 geological engineering problems. The above-mentioned upper-division courses all contain significant design components.

The capstone design experience for every graduating senior is the senior design project (GE 480), where student teams define project tasks in response to RFPs, conceptualize engineering activities under the scope of work and constraints, formulate technical approaches, analyze data, and provide solutions to engineering problems. Fundamentals of engineering economics and project management are an integral part of the course.

Examples of recent projects are listed below, and detailed design reports will be made available to the reviewer at the time of the visit:

- Reconnaissance Geological and Geotechnical Engineering Survey Methodology for Gas Pipeline Construction in Alaska (2008, one of the reports presented at the 2008 annual AEG meeting, p. 26)
- Preliminary Geological and Geotechnical Study of the Port MacKenzie Rail Corridor (2009)
- Construction Campsites Selection for the Alaska Gas Pipeline Project (2010)
Appendix A – Course Syllabi

1. **GE101 – INTRODUCTION TO GEOLOGICAL ENGINEERING**

2. 1.0 credits, Lecture: F 3:30 – 4:30 pm

3. Instructor: Dr. Debasmita Misra

4. Textbook: *None*

5. Specific Course Information:
   a) Catalog Description: Multiple aspects of geological engineering as a profession; the area and scope of the field.
   b) Prerequisites: *None*
   c) Required course

6. Specific goals for the course
   a) The goal of this course is to present students with information of the professional activities of a geological engineer.
   b) This course helps students meet outcomes:
      (h) An ability to understand the impact of engineering solutions in a global context
      (j) A knowledge of contemporary issues

7. Brief list of topics to be covered:

   - Introduction to Geological Engineering/AEG
   - Environmental and Engineering Issues of Alaska
   - Oil and Gas Resources of Alaska
   - Alaska Mining: Present & Future
   - Permafrost Characteristics
   - Geomaterials Engineering
   - Groundwater Hydrology
   - Mine Blasting and Rock Stability
   - Landslides and Slope Stability
   - Natural gas pipeline construction in cold regions
   - Conceptual Design for Carbon Dioxide Sequestration in Mafic Volcanic Rocks
   - Permafrost and Arctic Engineering
   - Underground construction and transportation tunnel
   - Exploration Geophysics
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


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:
      1. (d) an ability to function on multi-disciplinary teams;
      2. (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
1. **GE365 – GEOLOGICAL MATERIALS ENGINEERING**

2. 3.0 credits, Lecture: Monday, Wednesday 9:15-10:15 am; Labs: Monday 3:30-6:30 pm, Friday 8:00-11:00 am

3. Instructor: Dr. Margaret Darrow


5. Specific course information:
   a) 2010-2011 Catalog Description: Identification and classification of soils, physical and mechanical properties of soil, interaction of soils with subsurface water, subsurface exploration and case studies with an emphasis on permafrost.
   b) Prerequisites: ES208, GE261, or permission of instructor
   c) Required course

6. Specific goals for the course
   a) 1) To understand the fundamental principles of soil engineering, geological materials testing, and subsurface exploration; 2) To develop skills in solving typical soil mechanics problems; 3) To conduct typical laboratory tests on soils; 4) To develop technical writing skills.
   b) This course helps students meet outcomes:
      (b) an ability to design and conduct experiments, as well as to analyze and interpret data;
      (e) an ability to identify, formulate, and solve engineering problems

7. Brief list of topics to be covered:
   - Soil Sampling
   - Field Methods
   - Soils and Rocks
   - Weight-Volume Relationships
   - Excavation, Grading, Compaction
   - Groundwater
   - Stress
   - Consolidation
   - Strength
   - Slope Stability
   - Lateral Earth Pressure
   - Foundations
1. **GE375 – PRINCIPLES OF ENGINEERING GEOLOGY AND TERRAIN ANALYSIS**

2. 3.0 credits, Lecture: Monday, Wednesday, Friday 11:45am-12:45pm

3. Instructor: Dr. Margaret Darrow


5. Specific course information:
   a) 2010-2011 Catalog Description: Evaluation of terrain characteristics using basic geomorphic and engineering principles. Alaskan applications are provided due consideration.
   
   b) Prerequisites: GE261
   
   c) Required course

6. Specific goals for the course
   a) 1) To understand the basic processes of geomorphology and relationships between regional and local geomorphic conditions to engineering site selection, evaluation, and design; 2) To develop skills required in terrain analysis, including familiarity with ArcGIS; 3) To apply knowledge and skills to a terrain analysis project in Alaska.
   
   b) This course helps students meet outcomes:
   
   (g) an ability to communicate effectively;
   
   (l) a knowledge of engineering applications as related to geological resources and geohazards in Alaska and an ability to practice engineering in arctic-related projects

7. Brief list of topics to be covered:
   
   - Driving Forces
   - Tectonics
   - Volcanism
   - Bedrock Mapping
   - Chemical and Physical Weathering
   - Slope Processes
   - Fluvial Processes
   - Glacial Processes
   - Periglacial Processes
   - Permafrost
   - Wind Processes
   - Coastal Processes
   
   - Introduction to GIS
   - Importing Data
   - Map Design
   - GIS Output
   - Digitizing
   - Annotations
   - Spatial Analysis
   - 3-D Analysis
1. **GE376 – GIS APPLICATIONS IN GEOLOGICAL AND ENVIRONMENTAL ENGINEERING**

2. 3.0 credits, Lecture: Monday, 2:15-4:15pm, Lab: Monday, 4:15-5:25 pm

3. Instructor: Dr. Margaret Darrow


5. Specific course information:
   a) 2009-2010 Catalog Description: Fundamentals, concepts and components of geographic information systems (GIS) in engineering design. Introduction to acquiring, manipulating, and analyzing digital terrain data for geological engineering and environmental applications, and the assessment of mineral resources. Group projects on path and site selection for engineering projects are required.
   b) Prerequisites: GE261 or equivalent. Recommended: NRM F338
   c) Elective course

6. Specific goals for the course
   a) 1) To understand how GIS can be used for Geological and Environmental Engineering applications, such as assessing geohazards and making strategic planning decisions; 2) To understand the basic GIS concepts independent of any software; 3) To learn ArcGIS through laboratory exercises; 4) To present one’s findings through effective communication.
   b) This course helps students meet outcomes:
      (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, societal, political, ethical, health and safety, manufacturability, and sustainability;
      (g) an ability to communicate effectively;
      (l) a knowledge of engineering applications as related to geological resources and geohazards in Alaska and an ability to practice engineering in arctic-related projects.

7. Brief list of topics to be covered:
   - Introduction to GIS
   - Spatial Reference and Data Representation
   - Digital Representation
   - Raster Geoprocessing
   - Vector Geoprocessing
   - Geovisualization and Geospatial Information
   - Digital Terrain Modeling
   - Spatial Data Analysis
Modeling and Mining
Geospatial Data Quality and Standards
GIS Implementation and Project Management
GE Applications
1. **GE381/382 – FIELD METHODS AND APPLIED DESIGN I AND II**

2. 2.0 credits and 4.0 credits, respectively; Daily meeting times during the course, approximate work hours between 8:00 am and 6:00 pm

3. Instructor: Dr. Margaret Darrow

4. No required text

5. Specific course information:
   a) 2009-2010 Catalog Description: Techniques and geologic mapping, and geotechnical instrumentation applied to engineering design and resource evaluation.
   
   b) Prerequisites: ENGL111, ENGL211 or ENGL213, GE261, GEOS421, GEOS332
   
   c) Required course

6. Specific goals for the course
   a) 1) To provide students with practical experience in a variety of field settings collecting and presenting basic geologic field data, including field mapping of stratigraphic and structural problems using topographic maps, and airborne and/or satellite images; 2) to train students in the preparation of geologic maps in a variety of tectonic and lithologic settings, and in the development of written reports detailing the geologic history for several study areas; 3) to expose students to the use of geophysical data as an aid to geologic mapping; and 4) to apply the mapping techniques to typical geological engineering problems, such as slope stability analysis.

   b) This course helps students meet outcomes:

      (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice;

      (l) a knowledge of engineering applications as related to geological resources and geohazards in Alaska and an ability to practice engineering in arctic-related projects.

7. Brief list of topics to be covered:

   In-town exercises; preparation for independent field mapping

   Livengood exercises; preparation for independent field mapping

   Denali exercises; semi-independent geologic mapping

   Slope stability analysis with independent mapping
1. **GE405 – EXPLORATION GEOPHYSICS**

2. Credits and contact hours:
   
   2  
   3.0 credits, Lecture: Monday, Wednesday 10:30-11:30 a.m.; Lab: Tuesday 1:00-5:30 p.m.

3. Instructor’s name: Dr. Scott Huang

4. Text book, title, author, and year:
   
   3  
   (a) Engineering and Design Geophysical Exploration for Engineering and Environmental Investigations by Department of the Army U.S. Army Corps of Engineers, EM 1110-1-1802, 31 August 1995; 
   (b) Instructor’s lecture notes; 
   (c) field equipment operational manuals

5. Specific course information:
   
   a) 2010-2011 Catalog Description: Theory and application of gravity, magnetic, electrical, electromagnetic, radiometric, and seismic methods as used for geophysical exploration. Some field work. Special fees apply.
   
   b) Prerequisites: GE375; MATH 200X and PHYSICS 211X or equivalent.
   
   c) Required course

6. Specific goals for the course
   
   4  
   a) Specific goals
   
   - To be able to operate modern geophysical equipment for a field survey;
   - To be able to plan a field survey and conduct the experiment;
   - To be able to use appropriate means (e.g. computer programs, graphs, and tables) to present and interpret field results, and reach a conclusion; and
   - To understand the benefits and limitations of modern geophysical exploration equipment.
   
   b) This course helps students meet outcomes:
   
   (b) An ability to design and conduct experiments, as well as to analyze and interpret data.
   
   (k) An ability to use techniques, skills, and modern engineering tools necessary for engineering practice.

7. Brief list of topics to be covered:

   a) Lectures
   
   - Seismic methods: refraction theory and applications
   - DC resistivity methods: theory, field arrays, and applications
   - GPR method: theory and applications
   - EM Methods: TDEM theory and applications
   
   b) Labs
   
   - Seismic equipment, survey, and data analysis
   - DC resistivity equipment, survey, and data analysis
   - GPR equipment, survey, and data analysis
   - TDEM equipment, survey, and data analysis
1. **GE420 – SUBSURFACE HYDROLOGY**

2. 3.0 credits, Lecture: MW 11:45 am – 12:45 pm; Labs: TF 9:00-10:30 am

3. Instructor: Dr. Debasmita Misra


5. Specific course information:
   
a) Catalog Description: Hydrologic, geologic and other factors controlling groundwater flow, occurrence, development, chemistry and contamination. Elementary groundwater flow theory. Interactions between surface-subsurface hydrologic systems. Hydraulic characteristics of earth materials, engineering problems and models related to subsurface fluids, and properties of water.

   b) Prerequisites: GE F365 or permission of instructor; MATH F302; PHYS F211X.

   c) Required course

6. Specific goals for the course
   
a) The goals of this course are -

   i. To develop a basic understanding of physics, chemistry and mathematics as used in understanding concepts of ground water hydrology and the mechanics of fluid flow in porous media.

   ii. To develop an understanding of the various processes that govern ground water movement and contaminant transport in aquifers.

   iii. To be able to design, analyze, and estimate parameters pertinent to fluid flow and contaminant transport in porous media.

   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 within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

   (e) An ability to identify, formulate, and solve engineering problems

7. Brief list of topics to be covered:

   - Hydrologic Balance
   - Physical Properties of Aquifers
   - Principles of Flow
   - Geology and Groundwater
Wireline Well Logging
Deformation Storage and General Flow Equations
Steady Groundwater Hydraulics
Unsteady Groundwater Hydraulics
Computer Assisted Flow Modeling
Groundwater Chemistry
Groundwater Contamination
Groundwater Development and Management
1. **GE440 – SLOPE STABILITY**

2. Credits and contact hours:

   5 3.0 credits, Lecture: Tuesday, Thursday 3:40 - 5:10 p.m.

3. Instructor’s name: Dr. Scott Huang

4. Text book, title, author, and year:

   6 (a) Instructor’s lecture notes; (b) Landslides: Investigation and Mitigation, Transportation Research Board, Special Report 247, 1996 (optional); (c) Rock Engineering - Course Notes by Evert Hoek, 2004 (optional); (d) Hoek and Bray, Rock Slope Engineering, 1981 (optional)

5. Specific course information:

   a) 2009-2010 Catalog Description: Slope design for open pit mining and other excavation. Stability analysis by various methods and on-site measuring and monitoring techniques.

   b) Prerequisites: ES331

   c) Elective course

6. Specific goals for the course

   7 a) Specific goals

   - Understands the principles of structure geology, statics and dynamics, and mechanics of materials;
   - Successfully applies this knowledge to analyze slope stability issues; and
   - Be able to design an engineering plan to remediate problem slopes.

   b) This course helps students meet outcomes:

   (a) Apply mathematics, sciences, and engineering principles.
   (e) An ability to identify, formulate, and solve engineering problems

7. Brief list of topics to be covered:

   a) Lectures

   - Rock as engineering materials
   - Geological data collection and presentation
   - Failure criteria & kinematic analysis
   - Plane failure
   - Wedge failure & toppling
   - Soils & failure criteria
   - Soil slope analysis
1. **GE471 – REMOTE SENSING FOR ENGINEERING**

2. 3.0 credits, Lecture: MW 2:15 – 3:15 pm; Lab: R 2:15 – 5:15 pm

3. Instructor: Dr. Debasmita Misra


5. Specific course information:
   a) Catalog Description: Applications of remote sensing to geological engineering problems. Introduction to digital satellite image processing with hands-on practice.
   b) Prerequisites: GE F375 or permission of instructor; PHYS 212X.
   c) Required course

6. Specific goals for the course
   a) The goals of this course are –
      i. Understand how remote sensors work in procuring data on a global context, using satellites.
      ii. Learn to process and classify a satellite image for an engineering application.
      iii. Analyze and project the processed information to develop knowledge on contemporary issues.
   b) This course helps students meet outcomes:
      (h) An ability to understand the impact of engineering solutions in a global context
      (j) A knowledge of contemporary issues

7. Brief list of topics to be covered:
   Principles of Remote Sensing
   Electromagnetic Spectrum & its Interactions
   Spectral Reflectance Curves & Spectral Separation
   Nature of Images & Sensors
   Sensors and Satellites
   Image Processing
   Image Processing and Transformation Tools
   Image Processing and Classification
   Applications of Remote Sensing
1. **GE480W – SENIOR DESIGN**

2. Credits and contact hours:
   
   8 3.0 credits, Lecture: Friday Noon – 2:00 p.m.

3. Instructor’s name: Dr. Scott Huang

4. Text book, title, author, and year:
   
   9 Professional Practical Handbook (3\(^{rd}\)), *AEG Online Publication*, 1993

5. Specific course information:
   
   a) 2010-2011 Catalog Description: Design factors and procedures for the solution of geological engineering problems. A term design-project is the focus of the course.

   b) Prerequisites: ENGL 111X, 211X, or ENGL 213X; Senior standing in the geological engineering program with completion of GE 261, 365, 375, 381 or equivalent, 382 or equivalent, 405, 420 & 471

   c) Required course

6. Specific goals for the course
   
   a) Specific goals

   - Shares professional knowledge with other team members;
   - Shows professional respect and courtesy toward classmates and team members;
   - Demonstrates exemplary work ethics;
   - Acknowledges contribution or work of others;
   - Use correct grammar, spelling, and punctuation in written reports, and pronunciation in verbal communication;
   - Provides factual statements supported with evidences;
   - Understands the need for continual technical and professional enhancement; and
   - Accepts and welcomes objective peer review.

   b) This course helps students meet outcomes:

   - An understanding of professional and ethical responsibility
   - An ability to communicate effectively
   - A recognition of the need for, and an ability to engage in life-long learning.

7. Brief list of topics to be covered:

   a) Lectures

   - Proposal writing
   - Standards and guidelines
   - Project control
   - Slope design
   - Report writing
• Changed subsurface conditions
• Professional liability
• Expert witness and litigation
• Limitation of liability
b) Students’ work
• Proposal submission and presentation
• Progress reports
• Design project presentation
• Final report submission
GEOSCIENCES 213 - MINERALOGY - FALL 2010

LECTURES: MW 11:45-12:45                 Reich 235
LABS:  MW 2:15 – 5:15 p.m. OR MW 6-9 p.m.    Reich 235
INSTRUCTOR: Mary Keskinen                 Reich 340   X7769
           mjkeskinen@alaska.edu
TEACHING ASSISTANT: Bonnie Broman       Reich 312   X7585
                   bnbroman@alaska.edu
                       Jill Kooistra       Reich 312   X7585
                   jkooistra@alaska.edu

COURSE DESCRIPTION: The purpose of this course is to introduce beginning geology
students to the characteristics of the common rock-forming minerals: crystallography,
crystal structures, physical and chemical properties, systematic identification in the field
and the laboratory, optical and x-ray properties, occurrence, stability, and associations. Two
overall concepts will be stressed: how all these properties reflect the intrinsic order within
the crystal structure of these minerals, and how a basic knowledge of minerals provides a
key to the interpretation of geological environments and processes.

TEXTBOOKS:
    Sons.

    University Press.

MATERIALS:
    Students should have a hand lens (10X triplet suggested), a hand magnet, and a pocket
    knife.
    These and other materials will be provided as needed in the lab.

GRADING (TENTATIVE):
    Lab exercises 20%  Problem sets 10%  Laboratory quizzes (2 or 3) 10%
    Midterm exams (2) 40%  Final lecture exam 20%

- PLEASE NOTE: Reading assignments should be completed before the class
  for which they are scheduled!

Disability Services: 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. This class will work with the Office of
Disabilities Services (203 WHIT, 474-7043) to provide reasonable
accommodation to students with disabilities. Make sure to let the instructor know
if there are concerns of this type.
## SCHEDULE OF LECTURES & READING ASSIGNMENTS

<table>
<thead>
<tr>
<th>Lecture Topics</th>
<th>Reading</th>
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<tr>
<td><strong>SYMMETRY AND CRYSTALLOGRAPHY</strong></td>
<td></td>
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<tr>
<td><strong>SEPT</strong></td>
<td></td>
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<tr>
<td>8 Introduction, basic symmetry elements</td>
<td>MMS 1-18, 109-118</td>
</tr>
<tr>
<td>Combination of symmetry elements, plane groups</td>
<td>MMS 118-125; 143-156.</td>
</tr>
<tr>
<td>15 Point groups &amp; crystal systems</td>
<td>MMS 125-131; 182--208</td>
</tr>
<tr>
<td>Miller indices</td>
<td>MMS 131--142</td>
</tr>
<tr>
<td>22 Lattices &amp; space groups</td>
<td>MMS 156-168</td>
</tr>
<tr>
<td><strong>A. CRYSTAL CHEMISTRY</strong></td>
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</tr>
<tr>
<td>27 Atoms &amp; molecules &amp; bonding in minerals</td>
<td>MMS 37-65; CCC</td>
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<tr>
<td>183-219</td>
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<tr>
<td>29 Radius ratios, closest packing, coordination</td>
<td>MMS 66-80; CCC</td>
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<tr>
<td>221-258</td>
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<tr>
<td><strong>OCT</strong></td>
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<tr>
<td>4 MIDTERM EXAM #1</td>
<td>MMS 80-108</td>
</tr>
<tr>
<td>6 Crystal structure types</td>
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</tr>
<tr>
<td><strong>B. DESCRIPTIVE MINERAL CLASSIFICATION &amp; DETERMINATIVE</strong></td>
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</tr>
<tr>
<td>11 Systematic mineral identification</td>
<td>MMS 19-36; 266-274; 331-333</td>
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<tr>
<td>II MMS 368-398</td>
<td>13 Non-silicates I</td>
</tr>
<tr>
<td>III MMS 399-433</td>
<td>18 Non-silicates</td>
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<tr>
<td>diffraction theory</td>
<td>20 Non-silicates</td>
</tr>
<tr>
<td>454-458</td>
<td>25 X-ray</td>
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<tr>
<td>27 X-ray diffraction applications</td>
<td>MMS 307-321, CCC</td>
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<tr>
<td><strong>NOV</strong></td>
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<tr>
<td>1 Silicate mineral structures (overview)</td>
<td>MMS 434-482; CCC</td>
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<td>258-271</td>
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<tr>
<td>3 Silicate minerals I</td>
<td>MMS 483-505</td>
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<tr>
<td>8 Silicate Minerals II</td>
<td>MMS 505--534</td>
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<tr>
<td>10 Silicate Minerals III</td>
<td>MMS 534-553</td>
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<tr>
<td>15 MIDTERM EXAM #2</td>
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</tr>
</tbody>
</table>
OPTICAL MINERALOGY

NOV 17  Introduction to optics, polarization                  N 1-24; MMS 287-294
              Refractive index, isotropic materials
              N 25-36
24  Uniaxial minerals I: indicatrix theory                  N 37-65
29  Uniaxial minerals II: Birefringence                     MMS 294-299

DEC 1  Uniaxial interference phenomena                     N 65-75
6  Conoscopic methods for uniaxial minerals                MMS 300-305
8  Biaxial minerals I: indicatrix theory                   N 76-103
13  Biaxial minerals II: interference figures              N 103-109

FINAL LECTURE EXAM: Wednesday, December 15, 10:15 a.m. - 12:15p.m.
************************************************************************
CCC = Crystallography and Crystal Chemistry, Bloss - copies available
       in the classroom

N = Introduction to Optical Mineralogy, Nesse, 3rd edition.
************************************************************************

SCHEDULE OF GEO SCIENCES 213 LABORATORY EXERCISES

SEPT 8  A BRIEF INTRODUCTION TO MINERALS
       13  2-D SYMMETRY AND PLANE GROUPS
       15  POINT GROUPS WITH CRYSTALS AND WOODEN BLOCKS
       20  MILLER INDICES WITH WOODEN BLOCKS
       22  EXPLORING XL MORPHOLOGY WITH THE COMPUTER
(“SHAPE”)
       27  MINERALOGY AND THE INTERNET (COMPUTER EXERCISE)
       29  PACKING OF SPHERES, SYMMETRY IN 3-D

OCT 4  DENSITY-COMPOSITION-HARDNESS RELATIONSHIPS
       6  LECTURE AND LAB: MINERAL CHEMISTRY/PROBE FIELD TRIP
11  DETERMINATIVE MINERALOGY
13  HAND SPECIMENS I: NATIVE ELEMENTS, OXIDES,
    HYDROXIDES,
    HALIDES
18  HAND SPECIMENS II: SULFIDES AND SULFOSALTS
20  HAND SPECIMENS III: CARBONATES, SULFATES, BORATES,
    TUNGSTATES, ETC.
25  X-RAY DIFFRACTION METHODS

112
27 UNKNOWN IDENTIFICATION WITH X-RAY
DIFFRACTION/S.E.M. TOUR

NOV 1 NON-SILICATE HAND SPECIMEN MINERAL QUIZ
3 HAND SPECIMENS IV: NESO-, SORO-, CYCLO-SILICATE
MINERALS 8 HAND SPECIMENS V: CHAIN AND SHEET SILICATE MINERALS
10 HAND SPECIMENS VI: TECTO-SILICATES AND MINERALS
IN ROCKS 15 SILICATE
HAND SPECIMEN MINERAL QUIZ
17 INTRODUCTION TO THE PETROGRAPHIC MICROSCOPE
22 REFRACTIVE INDICES IN ISOTROPIC SUBSTANCES
UNIAXIAL OPTICS: DOUBLE REFRACTION IN CALCITE, REFRACTIVE INDICES
29 UNIAXIAL ORTHOSCOPIC PROPERTIES

DEC 1 UNIAXIAL MINERALS: INTERFERENCE FIGURES AND SIGN TESTS
6 MORE UNIAXIAL MINERAL METHODS
8 BIAXIAL MINERALS
13 MORE BIAXIAL MINERAL TECHNIQUES
## GEOSCIENCES 214: PETROLOGY                  SPRING 2011

Instructor: Mary Keskinen (Reich 340 - X 7769 - mjkeskinen@alaska.edu)
Teaching assistants: Bonnie Broman (Reich 312 - X7585 - bnbroman@alaska.edu) & Jill Kooistra (Reich 312 - X7585 - jkooistra@alaska.edu)
Class meetings: Lecture Monday & Wednesday, 11:45-12:45 (Reich 235)
Lab Monday/Wednesday, 2:15-5:15 p.m. or 6-9 p.m. (Reich 237)
MK Office Hours: Tuesday 10-11 a.m.; Friday 10-11 a.m.

### LECTURES

<table>
<thead>
<tr>
<th>January</th>
<th>24</th>
<th>Structure and composition of the earth, general characteristics of igneous rocks</th>
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<tr>
<td></td>
<td>26</td>
<td>Mineralogical classification of igneous rocks</td>
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<td>31</td>
<td>Field characteristics of igneous rocks</td>
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<tr>
<td>February</td>
<td>2</td>
<td>Phase rule and phase diagrams</td>
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<td>7</td>
<td>Binary systems &amp; fractional crystallization</td>
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<td>9</td>
<td>Ternary systems &amp; Bowen’s Reaction Series</td>
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<td></td>
<td>14</td>
<td>Dealing with a more complex system: the real world</td>
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<td>16</td>
<td>Chemical classification of igneous rocks</td>
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<td>470</td>
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<td></td>
<td>21</td>
<td>Basalts, tectonics, and ophiolites</td>
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<td>23</td>
<td>Continental volcanism</td>
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<td>28</td>
<td>Subduction and volcanism</td>
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<tr>
<td>March</td>
<td>2</td>
<td>Granites and batholiths</td>
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<td></td>
<td>7</td>
<td>The Best Bits of Igneous Rocks</td>
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<td>9</td>
<td>Metamorphic Processes</td>
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<td>**</td>
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<td>SPRING BREAK **</td>
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<tr>
<td>21</td>
<td>21</td>
<td>Facies and Facies Series</td>
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<td>23</td>
<td>Igneous Petrology Exam</td>
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<td>28</td>
<td>Graphical Methods for Metamorphism</td>
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<td>30</td>
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<tr>
<td>April</td>
<td>4</td>
<td>Metamorphic Reactions</td>
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<td>6</td>
<td>Quantitative Metamorphic Petrology</td>
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<td>11</td>
<td>Contact Metamorphism and Low P/T Facies Series</td>
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<td>447-462</td>
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<td></td>
<td>13</td>
<td>Regional Metamorphism: Mod P/T Facies Series</td>
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<td>427-439</td>
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<td>18</td>
<td>-as above-</td>
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<td>20</td>
<td>High P/T Facies Series: Blueschists &amp; Eclogites</td>
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<td>25</td>
<td>Ocean-floor and Geothermal Metamorphism</td>
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<td>27</td>
<td>Isotopes &amp; Trace Elements in Metamorphic</td>
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</tbody>
</table>
Systems

May 2 Petrotectonics

Hyndman, 657-664.

4 Review and Overview of Metamorphism

FINAL EXAM: Wednesday, May 11 - 10:15-12:15

READING ASSIGNMENTS MUST BE COMPLETED BEFORE THE CLASS FOR WHICH THEY ARE ASSIGNED!

GRADING: The course is divided into two units. The first section deals with igneous rocks, then metamorphic rocks will be covered. The homework assignments and lecture exams will constitute about 60% of your final grade. The laboratory grade is worth approximately 40% of the final grade.

Letter grades and +/- grades will be given.

REQUIRED TEXTBOOK:

TEXTS FOR SUPPLEMENTARY READING ASSIGNMENTS:

Assigning reading from books other than Blatt, Tracy, & Owens will be xeroxed and made available in the classroom (235).

LAB SCHEDULE FOR IGNEOUS AND METAMORPHIC ROCKS

January 24 Review of Optical Mineralogy - Lecture and Lab
26 Biaxial Minerals - Lecture and Lab
31 Biaxial Minerals and Getting Up to Speed

February 2 Minerals in Thin Section
7 Igneous minerals and textures
9 Igneous minerals and the microscope
14 M&M lab exercise, thin section preparation and the electron microprobe
16 Plutonic rocks I
21 Plutonic rocks and microscopes I
23 Plutonic rocks II
28 Plutonic rocks and microscopes II
2 Volcanic rocks in hand specimen

March 7 Volcanic rocks and microscopes
9 Pyroclastic rocks and volcano movie

** SPRING BREAK **

21 Unusual igneous rocks in hand sample and thin section
Metamorphic Minerals
28 Regional Metamorphic Rocks I - pelitic & carbonate rocks
30 Regional Metamorphic Rocks I - microscopic features

April 4 Regional Metamorphic Rocks II - mafic & ultramafic rocks
COURSE DESCRIPTION:

Petrology and Petrography (Geosciences 214) covers the origin, occurrence, and classification of igneous and metamorphic rocks. The format involves 2 hours of lecture per week, largely devoted to more theoretical aspects of these topics, while laboratory work (6 hours per week) involves hand lens identification and thin section examination of representative igneous and metamorphic rocks.

Disability Services: 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. This class will work with the Office of Disabilities Services (203 WHIT, 474-7043) to provide reasonable accommodation to students with disabilities. Make sure to let the instructor know if there are concerns of this type.
Instructor: Michael Whalen, Office: REIC 332, phone: 5302, e-mail: mtwhalen@gi.alaska.edu
Lecture: TR 2:00-3:30, REIC 233
Labs: W 2:15 - 5:25 PM, REIC 229
Office hours: TR 4:00 - 5:00 PM, or by appointment.
Course Prerequisites: GEOS 101 or GE 261, GEOS 112

Course Description and Objectives:

Stratigraphic successions provide the most comprehensive record of Earth history available. Stratigraphers and sedimentologists must apply their knowledge of how sedimentary successions are deposited and preserved to interpret the geologic history recorded in the rocks. This course is designed to give you an introduction to the methods used to interpret Earth history through examination of the stratigraphic record. An actualistic approach will be employed, meaning that modern processes and depositional environments will serve as guides to interpreting ancient sedimentary deposits. You must, however, proceed with the understanding that not all sedimentary processes or environments that existed in the past are well represented in the present. Interpretation of Earth history depends on a well-developed background in a variety of stratigraphic methods which you will become acquainted with during this course.

The semester will be divided up into three general segments briefly outlined below. A more detailed semester outline follows on the next page. The first part of the course will deal with the basic aspects of sedimentation and the formation of sedimentary rocks. This will provide the framework to interpret the processes of sedimentation responsible for forming different types of sedimentary rocks. The second part will look at the dominant types of environments where sediments are deposited to furnish the actualistic background to interpret ancient environments. The third part will entail synthesizing sedimentologic and stratigraphic data to permit interpretations of Earth history.

Part I - Making Rocks
Getting To Know Sediment
Transporting and Depositing Sediment
Sedimentary Rocks

Part II - Making History, Shifting Environments and Stratigraphic Successions
Terrestrial Environments
Shallow Marine Environments
Deep Marine Environments

Part III - Interpreting History
Converting Sediments to Rocks
Stratigraphy and Correlation
Stratigraphic Methods (Litho-, Bio-, Magneto-, Chemo-, Subsurface, Sequence stratigraphy)
Basin Analysis
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Quiz/Exam</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>R Sept. 2</td>
<td>Introduction: Stratigraphy, Sedimentology, Facies, and Geologic Time</td>
<td></td>
<td>Ch. 1</td>
</tr>
<tr>
<td>T Sept. 7</td>
<td>Sedimentary Grains, Shape, and Fabric</td>
<td></td>
<td>Ch. 2</td>
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<tr>
<td>R Sept. 9</td>
<td>Siliciclastic Sediments and Rocks</td>
<td></td>
<td>Ch. 2</td>
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<tr>
<td>T Sept. 14</td>
<td>Transport of Sediment</td>
<td></td>
<td>Ch. 4</td>
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<tr>
<td>R Sept. 16</td>
<td>Sedimentary Structures</td>
<td></td>
<td>Ch. 4</td>
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<tr>
<td>T Sept. 21</td>
<td>Carbonate Sediments and Rocks</td>
<td></td>
<td>Ch. 3</td>
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<tr>
<td>R Sept. 23</td>
<td>Other Sedimentary Rocks</td>
<td>Quiz 1</td>
<td>Ch. 3</td>
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<tr>
<td>S Sept. 25</td>
<td>Field Trip – Usibelli Group Healy</td>
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<tr>
<td>T Sept. 28</td>
<td>Introduction to Continental Environments</td>
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<td>Ch. 5 &amp; 6</td>
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<tr>
<td>R Sept. 30</td>
<td>Fluvial Environments and Paleosols</td>
<td></td>
<td>Ch. 6 &amp; 9</td>
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<tr>
<td>T Oct. 5</td>
<td>Fluvial and Glacial Environments</td>
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<td>Ch. 7 &amp; 9</td>
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<tr>
<td>R Oct. 7</td>
<td><strong>Exam 1</strong></td>
<td>Exam 1</td>
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<tr>
<td>T Oct. 12</td>
<td>Introduction to Marine Environments</td>
<td></td>
<td>Ch. 11</td>
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<tr>
<td>R Oct. 14</td>
<td>Marginal Marine Environments – Deltas, Estuaries, Coastlines</td>
<td></td>
<td>Ch. 12 &amp; 13</td>
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<tr>
<td>T Oct. 19</td>
<td>Shallow Siliciclastic Marine Environments</td>
<td></td>
<td>Ch. 13 &amp; 14</td>
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<tr>
<td>R Oct. 21</td>
<td>Reefs and Carbonate Platforms</td>
<td></td>
<td>Ch. 14</td>
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<tr>
<td>T Oct. 26</td>
<td>Deep Ocean Environments</td>
<td>Quiz 2</td>
<td>Ch. 15</td>
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<tr>
<td>T Oct. 28</td>
<td>From Sediments to Rocks (Guest Lecture)</td>
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<td>Ch. 17</td>
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<tr>
<td>T Nov. 2</td>
<td>Lithostratigraphy and Correlation</td>
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<td>Ch. 18</td>
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<tr>
<td>R Nov. 4</td>
<td>Biostratigraphy and Correlation</td>
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<td>Ch. 19</td>
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<tr>
<td>T Nov. 9</td>
<td><strong>Geochronology</strong></td>
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<td>Ch. 20</td>
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<tr>
<td>R Nov. 11</td>
<td><strong>Exam 2</strong></td>
<td>Exam 2</td>
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<tr>
<td>T Nov. 16</td>
<td>Subsurface Stratigraphy: Well Logs and Seismic Stratigraphy</td>
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<tr>
<td>R Nov. 18</td>
<td>Seismic and Sequence Stratigraphy</td>
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<td>Ch. 22</td>
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<tr>
<td>T Nov. 23</td>
<td>Thanksgiving Break</td>
<td></td>
<td>Ch. 22 &amp; 21</td>
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<tr>
<td>R Nov. 25</td>
<td>Sequence Stratigraphy (Guest Lecture)</td>
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<td>Ch. 21</td>
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<tr>
<td>T Nov. 30</td>
<td>Chemostratigraphy (Guest Lecture)</td>
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<td>Ch. 20</td>
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<tr>
<td>R Dec. 2</td>
<td>Magnetostratigraphy</td>
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<td>Ch. 20</td>
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<tr>
<td>T Dec. 6</td>
<td>Sedimentary Basins and Basin Analysis</td>
<td></td>
<td>Ch. 23</td>
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<tr>
<td>R Dec. 9</td>
<td>Review, Earth Through Geologic Time</td>
<td></td>
<td>Ch. 24</td>
</tr>
<tr>
<td>R Dec. 16</td>
<td>Final Exam 1:00-3:00 pm</td>
<td>Exam 3</td>
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Lab Schedule

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<th>Date</th>
<th>Topic</th>
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<td>Sept. 8</td>
<td>Fluvial Field Trip</td>
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<tr>
<td>Sept. 15</td>
<td>Sediments – Grain Size and Textures</td>
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<td>Sept. 22</td>
<td>Sedimentary Rocks</td>
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<tr>
<td>Sept. 29</td>
<td>No Lab</td>
</tr>
<tr>
<td>Oct. 6</td>
<td>Primary Sedimentary Structures</td>
</tr>
<tr>
<td>Oct. 13</td>
<td>Introduction to Sedimentary Petrography</td>
</tr>
<tr>
<td>Oct. 20</td>
<td>Biogenic Sedimentary Structures</td>
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<tr>
<td>Oct. 21</td>
<td>Siliciclastic Facies Analysis</td>
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<tr>
<td>Nov. 3</td>
<td>Carbonate Facies Analysis</td>
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<tr>
<td>Nov. 10</td>
<td>Sedimentary Petrography and Diagenesis</td>
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<tr>
<td>Nov. 11</td>
<td>Lithostratigraphy and Correlation</td>
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<tr>
<td>Nov. 24</td>
<td>Subsurface Strat: Well Logs</td>
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<tr>
<td>Dec. 1</td>
<td>Subsurface Strat: Seismic Stratigraphy</td>
</tr>
<tr>
<td>Dec. 8</td>
<td>Sequence Stratigraphy</td>
</tr>
</tbody>
</table>

Course Grading Break Down

- Quizzes and Homework - 25%
- Class Participation - 5%
- Exams - 40%
- (Midterms - 25%, Final - 15%)
- Lab 30%

Course Goals and Student Learning Outcomes

In this course you will be required to learn to identify sedimentary rocks and structures and develop interpretations of changing sedimentary environments from vertical successions of sedimentary rocks. You will also develop expertise using several different types of stratigraphic data and analyses. The major goal of stratigraphic analysis is to develop a better understanding of Earth history.

Required Supplies: Hand lens, colored pencils, ruler, protractor

Instructional Methods, Evaluation, and Course Policy

This course will be a mixture of traditional lectures and active learning including classroom discussions and lab exercises. Quizzes and exams will be based on lectures, lab exercises, and assigned readings. Lectures and readings are meant to compliment one another. Material covered in lecture will not always be covered in the readings (and visa versa). Therefore, lecture attendance and keeping up with assigned readings is vital (if you do happen to miss a lecture be sure to review the PowerPoint presentation and get a copy of the lecture notes from a fellow student). Class attendance is highly recommended. Grading will be based on quizzes, exams, homework assignments, labs and participation in class
discussions. Scores will be tabulated and normalized to a 100% scale. Final grades will be determined on a curve according to the breakdown above and assigned using the plus/minus system. Make-ups for missed labs, exams, or quizzes will be permitted only with a valid excuse. Lab exercises and homework must be turned in one week after the lab exercise or homework was assigned. Two percent of the total score will be deducted per day for late lab or homework assignments. You are encouraged to work together on homework and during lab sessions but you must submit your own work for evaluation. All exams and quizzes will be closed book and must be completed on your own. Students are required to adhere to the UAF Student Code of Conduct.
SCHEDULE FOR GEOS 332 "ORE DEPOSITS & STRUCTURE"  Spring 2011

Rainer Newberry, Instructor  rjnewberry@alaska.edu  Reich 328 x6895  home 479-0140  [best to email me]
TA: Michelle Deal  Reich 321  x7585  mideal@alaska.edu

Class: MW 5:30-whenever  room 236  room available for working in : most evenings, weekends
Lecture: Monday 5:30→ ca. 6:30;  lab: M ~6:40→ whenever, Weds 5:30→whenever
LABS are assigned on Monday and are due on the following Monday. Late labs will be penalized

C.

D. ➔ NEEDED FOR CLASS: 1. hand lens (I have some) 2. protractor/ruler (ditto) 3. knife

<table>
<thead>
<tr>
<th>DATE</th>
<th>LECTURE TOPIC</th>
<th>READING</th>
<th>LAB TOPIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td>1. Overview of concepts, objectives, definitions of ore deposits. Review of major rock types &amp; minerals</td>
<td>16-24, 99-103</td>
<td>1. Review of rock types &amp; ore mineralogy; simple geologic x-sections</td>
</tr>
<tr>
<td>4</td>
<td>2. Example of deposit models: placers &amp; paleoplacers</td>
<td>36-8; 244-52</td>
<td>2. Placers, paleoplacers, and non-placers</td>
</tr>
<tr>
<td>1/3</td>
<td>3. basic geologic map interpretation—folds, faults, etc.</td>
<td>TBA</td>
<td>3. Use of maps and x-sections</td>
</tr>
<tr>
<td>2/7</td>
<td>4. Magmatic Oxide deposits</td>
<td>128-138</td>
<td>4. Magmatic OXIDE deposits</td>
</tr>
<tr>
<td>2/1</td>
<td>5. Intersecting lines &amp; planes, faults, thickness &amp; depth; cross-sections</td>
<td>26-29; TBA</td>
<td>5. thickness, depth, intersections, cross-sections</td>
</tr>
<tr>
<td>4</td>
<td>6. Magmatic Sulfide deposits</td>
<td>139-156</td>
<td>6. Magmatic SULFIDE deposits</td>
</tr>
<tr>
<td>2/2</td>
<td>7. Intro to plutonic-hydrothermal ores:alt’n &amp; Cu-Mo ore</td>
<td>170-188</td>
<td>7. Intro to porphyry Cu-Mo deposits</td>
</tr>
<tr>
<td>8</td>
<td>SPRING BREAK 3/14- 3/19</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1 deposits
8 deposits
4/1 11. Epithermal deposits: general notions and 221-229 11. epithermal precious metal variations deposits
1 deposits
4/2 12. Submarine volcanogenic massive sulfide 202- 12. VMS and related deposits deposits
8 10,305-10
5 43,190-202 type
5/2 14. Drill hole logging 14. Drill hole logging

15. FIELD TRIP—Sat May 8 ???

TAKE-HOME FINAL EXAM DUE 17 MAY 2011

1Textbook: Evans, Ore Geology & Industrial Minerals, 3rd Ed + other readings to be assigned

Course Description: Distribution and characteristics (especially mineralogy, morphology, and structure) of major mineral deposit types with background on structural techniques. Emphasis on application to mineral exploration and development. Laboratory exercises stress recognition of major mineral deposit types, zoning, and grade patterns; and use of structural techniques in mineral deposit exploration and development.

Student Learning Outcomes: By actively participating in this course you will become proficient at
1. Identifying common ore and alteration minerals and rock types;
2. Recognizing major ore deposit types from hand specimen, map, and outcrop characteristics
3. Recognizing simple geological structures from map data
4. Solving simple structural problems (e.g., fault offset, unit strike & dip, unit thickness) from map data; and
5. Understanding the importance and limitations of models in mineral deposit exploration and development
Instructional Methods: Weekly reading assignments will be made to accompany the lectures. These will be of some help in working on the lab exercises. Lab exercises are given out on Monday and are due the following Monday. They will be returned to you on Monday evening (?) with some oral feedback. It is vital to complete the weekly lab exercises, as it is essentially impossible to learn the course material without doing so. It is virtually impossible to catch up if you fall behind in the labs!! And since the course topics are broadly cumulative, lack of understanding of one topic will make it very difficult to progress to the next.

Course Policies: Naturally, I would like you to attend class and to show up on time. If you know you will miss a class let me know and I will give or email you the lecture notes associated lab exercise. As routine completion of laboratory exercises is essential to understanding the material in this course, I will submit an instructor-designated drop if you are missing more than 2 lab assignments at the 5th week or 9th week of classes. Michelle and I encourage students to work together—but we also insist that everyone in the class does his/her own work.

Evaluation: There will be a take-home final exam. (I'll generate a mid-term exam if lots of students are behind in turning in labs. This is a threat I may be forced to carry out.
Don’t MAKE ME!!) The final exam is described in greater detail at the end of this document. I reserve the right to dock points for severely late labs.

Student grades in the class reflect the degree to which student learning outcomes have been achieved. Overall class grade based on:

Weekly lab write-ups: 80%, final exam: 20%. (If a mid term, it will count 20%).

Final grades will be normalized to the highest point total among students in the class. A point total within 90% of this will be an ‘A’; within 80% = ‘B’; within 70% = ‘C’, within 60% = ‘D’, < 60% = ‘F’.

Support Services: To be honest, there really aren’t any that will particularly help you with this class.

Disabilities Services: The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to campus and course materials. If you have a documented disability, please let me know within the first two weeks of class, and I will work with the Office of Disabilities Services to make the appropriate accommodation. If you have a specific undocumented physical, psychiatric or learning disability, you will benefit greatly by providing documentation of your disability to Disability Services in the Center for Health and Counseling, 474-7043, TTY 474-7045.

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Geos 332 spring 2011 Take-home Final Exam Directions   Due on May 17

lığın First Draft….this might change…

Write a 5 page essay (typed) concerning two of the deposits/deposit types we visit on our all-day field trip. Start by describing the characteristics of each & then briefly compare & contrast them.

Characteristics you should consider include: what is the ore?; what are the ore minerals? what are associated ore minerals/elements? what are the gangue and alteration minerals? how is the ore distributed, on both the detailed (hand specimen and finer) and broad (ore deposit) scale? what is the zoning of ore and ore elements? what is the zoning of the alteration? What observable characteristics are used to say a given rock is likely to be ore? (e.g., alteration, texture, mineralogy…)

What is the best estimate of the age of the deposit? What is the origin (as best known today) of the deposit? What ‘type’ (model) best fits each deposit?

What is the role of the mine geologist in the mining operation? How (in a general way) is or was the ore separated and concentrated? What is done with the waste and the tailings?

What procedures/techniques were employed to find the deposit in the first place? How does mine-scale exploration take place? How can one use
knowledge of this deposit to explore for other or similar deposits in the general area?

You don’t need to address all these questions and related issues can be tackled instead, but the key is to show me that you’ve learned something from the class, both in terms of the information you present and the manner that you discuss it.
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.


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-dimensions, 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:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>20%</td>
</tr>
<tr>
<td>Field Check-offs</td>
<td>10%</td>
</tr>
<tr>
<td>Field projects</td>
<td>20%</td>
</tr>
<tr>
<td>Mid term &amp; Final</td>
<td>50%</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Role of Min 202 Mine Surveying</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome A: Knowledge of mathematics, science and engineering principles and the ability to apply the knowledge</td>
<td>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</td>
</tr>
<tr>
<td>Outcome F: Understanding of professional and ethical responsibility</td>
<td>The legal significance of standard survey y notes, and the legal responsibility of the professional surveyor (land surveyor) are stressed and understood.</td>
</tr>
<tr>
<td>Outcome K: Ability to use techniques, skills and modern engineering tools for engineering practice</td>
<td>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.</td>
</tr>
</tbody>
</table>
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: AsPosted


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

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Role of MIN370</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome A: An ability to apply knowledge of mathematics, science &amp; engineering Principles</td>
<td>Use of fundamental mechanics of materials principles and application of mathematical knowledge gained in calculus and other math courses.</td>
</tr>
<tr>
<td>Outcome B: An ability to design and conduct experiments and the ability to analyze the data, interpret results and draw conclusions</td>
<td>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.</td>
</tr>
<tr>
<td>Outcome K: The ability to use the techniques, skills and modern engineering tools for engineering practices</td>
<td>The class will train students to utilize laboratory equipment and computer tools for the required engineering work.</td>
</tr>
</tbody>
</table>

**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**

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

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:
1. Mineral Valuation
2. Compound Interest Formulas and Applications
3. Present, Annual & Future Value; ROR and Break Even Analysis
4. Cumulative Cash Position Diagrams and Ratio Analysis
5. Mutually Exclusive and Non-Mutually Exclusive Project Analysis
6. Capital & Operating Costs and Cash Flows
7. Depreciation, Depletion and Amortization
8. Income Taxes and After-Tax Investment Decisions
9. Escalated & Constant Dollars
10. Risk and Uncertainty Analysis
11. 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.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Role of Min 313</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome E: The ability to identify, formulate and solve engineering</td>
<td>Students learn to evaluate, quantify and solve engineering economics problems involving, NPV, NAV, NFV, ROR, GROR, PVR and BCR ratios, payback</td>
</tr>
<tr>
<td>problems</td>
<td>periods and breakeven analysis after developing appropriate investment time lines.</td>
</tr>
<tr>
<td>Outcome G: The ability to communicate effectively</td>
<td>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).</td>
</tr>
<tr>
<td>Outcome K: An ability to use the techniques, skills and modern</td>
<td>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.</td>
</tr>
<tr>
<td>engineering tools necessary for engineering practice</td>
<td></td>
</tr>
</tbody>
</table>

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
1) **ES 201 – Computer Techniques**

2) 3 Credits, Lecture: MW 10:30 – 11:30 am, Lab: M 2:15 – 5:15 pm

3) Instructor: H. Ed Bargar

4) No text.
   a) Class Web site located at: [http://meddept.engr.uaf.edu](http://meddept.engr.uaf.edu)

5) Specific course information
   a) Catalog Description: Basic computer programming, in C/C++, with applications from all fields of engineering. Introduction to MATLAB.
   b) Prerequisite: MATH 107X & MATH 108 or Co-requisite: MATH 200X.
   c) Required Course.

6) Specific Goals for the course:
   a) Develop a basic understanding of how computers work with and store information. Concepts of structured programming, which can be applied in many programming languages, are taught using the C++ language. These concepts and more advanced constructs are further developed using the Matlab programming/user environment. Upon completion of this course, the student should be: familiar with how computers utilize memory and file storage and the difference between an interpreted and compiled computer language; able to properly implement the three primary programming structures: sequential, selective, and repetitive; understand how to organize programs into functions for efficient use/re-use and be able to write functions that call other functions; able to design and write computer programs to solve engineering problems.
   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.
      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 covered.
   a) Basics of computer memory and file organizations and workings.
   b) The C++ computer programming language and the basics of all structured computer programming languages.
   c) The Sequential Structure in C++ programming.
   d) Selective Structures in C++ programming.
   e) Repetitive Structures in C++ programming.
   f) Task-specific functions and program organization in C++ programs.
   g) File I/O (input/output) using C++.
   h) The Matlab computer operating/programming environment.
   i) Interactive operations using the Matlab environment.
   j) Programming functions in Matlab.
k) Selective Structures in Matlab.
l) Repetitive Structures in Matlab.
m) File I/O in Matlab programs and interactively from the User Interface.
ES 208 – Mechanics

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

2. Instructor: Gang Chen (MIN)


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
ES 331 - Mechanics of Materials

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

2. Instructor: Yongtao Dong (CEE)


   a. Other handouts will be provided.

4. 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

5. 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

6. 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, v 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
12 ES 341 – Fluid Mechanics

1. 4 credits, Lecture: MWF 10:30am – 11:30am; Lab: M,T,W, R: 2:15pm – 5:15pm

2. Instructor: Dennis Filler


4. 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

5. 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

6. 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
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 an 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](mailto: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 not 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. 

**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

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

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Laboratory Experiments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 24-28</td>
<td>American Chemical Society Standardized Placement Exam (Mandatory Attendance)</td>
</tr>
<tr>
<td>2</td>
<td>Jan 31- Feb 4</td>
<td>Safety Lab (Mandatory Attendance)</td>
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<tr>
<td>3</td>
<td>Feb 7-11</td>
<td>Intro to Lab Techniques</td>
</tr>
<tr>
<td>4</td>
<td>Feb 14-18</td>
<td>Reactions in Aqueous Solution</td>
</tr>
<tr>
<td>5</td>
<td>Feb 21-25</td>
<td>ID of an Unknown Substance</td>
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<tr>
<td>6</td>
<td>Feb 28-Mar 4</td>
<td>Cycle of Copper Reactions</td>
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<tr>
<td>7</td>
<td>Mar 7-11</td>
<td>Enthalpy of Neutralization</td>
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<tr>
<td>8</td>
<td>Mar 14-18</td>
<td>No Lab (Spring Break)</td>
</tr>
<tr>
<td>9</td>
<td>Mar 21-25</td>
<td>Intro to Spectroscopy</td>
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<tr>
<td>10</td>
<td>Mar 28-Apr 1</td>
<td>Spectroscopy &amp; Water Hardness</td>
</tr>
<tr>
<td>11</td>
<td>Apr 4-8</td>
<td>Isotopes and GC/MS</td>
</tr>
<tr>
<td>12</td>
<td>Apr 11-15</td>
<td>Computational Chemistry</td>
</tr>
<tr>
<td>13</td>
<td>Apr 18-22</td>
<td>Synthetic Chemistry (Aspirin)</td>
</tr>
<tr>
<td>14</td>
<td>Apr 25-29</td>
<td>Standardized post-test Mandatory Attendance (Extra Credit will be awarded for this exercise)</td>
</tr>
</tbody>
</table>
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:
2) Access to Chapter 10 (Organic Chemistry), Kotz et al 7th Ed. Either in Vol. 1, or via e-Chapter from
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

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 hand 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 8 or more 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 before 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):

<table>
<thead>
<tr>
<th>Item</th>
<th>Maximum Pts</th>
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<tbody>
<tr>
<td>Exam 1</td>
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<tr>
<td>Exam 2</td>
<td>100</td>
</tr>
<tr>
<td>Exam 3</td>
<td>100</td>
</tr>
<tr>
<td>Final Exam</td>
<td>100</td>
</tr>
<tr>
<td>OWL Homework</td>
<td>80</td>
</tr>
<tr>
<td>Clicker score</td>
<td>70</td>
</tr>
<tr>
<td>Lab</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>650</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>%</th>
<th>Letter Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>88-99%</td>
<td>A</td>
</tr>
<tr>
<td>77-88%</td>
<td>B</td>
</tr>
<tr>
<td>66-77%</td>
<td>C</td>
</tr>
<tr>
<td>55-66%</td>
<td>D</td>
</tr>
<tr>
<td>Less than 55%</td>
<td>F</td>
</tr>
</tbody>
</table>

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 significantly 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.
Fundamentals 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:

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.
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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 requirements, 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 significantly lower!).

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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:
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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: lberman@alaska.edu (best way to contact me!)
AIM screen name: leahwrenn
Teaching Assistant: Kevin Joyce, kjjoyce@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.


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 sections 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 ≥ 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)

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

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online Homework</td>
<td>10%</td>
</tr>
<tr>
<td>Quizzes, Written Homework, and other graded material</td>
<td>15%</td>
</tr>
<tr>
<td>Limit Proficiency Test</td>
<td>5%</td>
</tr>
<tr>
<td>Derivative Proficiency Test</td>
<td>5%</td>
</tr>
<tr>
<td>Exam 1</td>
<td>15%</td>
</tr>
<tr>
<td>Exam 2</td>
<td>15%</td>
</tr>
<tr>
<td>Exam 3</td>
<td>15%</td>
</tr>
<tr>
<td>Final exam</td>
<td>20%</td>
</tr>
</tbody>
</table>

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 $g(x) = 23/6 + (5/57)/(x - 93)$. This implies that the lower bound for an A- is 93.2%, 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 Americans 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 accommodation to students with disabilities. Please come talk to me as soon as possible if you have/need accommodations.
Instructor: Gordon Williams
Contact Details: Chapman 303B, gwilliams@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
Course Web Page: http://sites.google.com/a/alaska.edu/gordon-williams/home/2015S2011
Prerequisites: a grade of C or better in Math 200 Calculus I or its equivalent

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 I am 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:

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

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  

Instructor: Elizabeth S. Allman

Contact Details: Chapman 3383, 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.


Midterm: (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. They 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 a '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:

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Homework</td>
<td>10</td>
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<tr>
<td>Quizzes</td>
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<td>Midterm 1</td>
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<td>Midterm 2</td>
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<td>Final Exam</td>
<td>30</td>
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</tbody>
</table>

Grade Bands: A, A- (90 - 100%); B+, B, B- (80 - 90%); C+, C, C- (70 - 79%); D+, D, D- (60 - 70%); F (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:


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.


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.dmns.uaf.edu/dmns/Policies.html](http://www.dmns.uaf.edu/dmns/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):

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<tr>
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<th>(63, 67]</th>
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<th>(70, 73]</th>
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<th>(83, 87]</th>
<th>(87, 90]</th>
<th>(90, 93]</th>
<th>(93, 97]</th>
<th>(97, 100]</th>
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<tbody>
<tr>
<td>A+</td>
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</table>

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

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University and Department Policies: Your work in this course is governed by the UAP Honor Code. Visit [http://www.dm.edu/dm/policies.html](http://www.dm.edu/dm/policies.html) for the Department 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 WhIST, 474-7045) to set up any necessary accommodations.

Have a great semester and best of luck!!!
Appendix B – Faculty Vitae

1. Margaret M. Darrow


   13 Bachelor of Science, Geological Engineering, University of Alaska Fairbanks, 2002

   14 Teachers for Alaska Certification Program, Math/Science, University of Alaska Fairbanks, 1997

   15 Master of Science, Geology, University of Alaska Fairbanks, 1995

   16 Bachelor of Science, Geology, University of Washington, 1993

3. University of Alaska Fairbanks, Assistant Professor, 2008-present, full time

4. Alaska Department of Transportation and Public Facilities, Geotechnical Engineering Assistant, 2005-2008, full time

   17 Alaska Department of Transportation and Public Facilities, Graduate Intern, 2002-2005, part time

   18 University of Alaska Fairbanks, Teaching Assistant/Student Assistant, 2001-2002, part time


   20 Minchumina Community School, Iditarod Area School District, Secondary Teacher, 1997-1999, full time

   21 University of Alaska Fairbanks, Graduate Teaching Assistant, 1993-1995, part time

5. None

6. Tau Beta Pi, Phi Kappa Phi, Association of Environmental and Engineering Geologists (AEG), American Society of Civil Engineers (ASCE), United States University Council on Geotechnical Education and Research (USUCGER)

7. National Science Foundation Graduate Research Fellowship, Tau Beta Pi Fellow

8. Honors Faculty Council (UAF), Research Advisory Committee (UAF), Tau Beta Pi Alaska Alpha Chapter advisor (UAF), AEG advisor (UAF), Ad Hoc reviewer (NSF), Reviewer for Cold Regions Science and Technology journal


10. Attendance at the Geotechnical Instrumentation for Field Measurements course in Florida, April 2011
1. Name: Scott L. Huang
2. Education
   - Ph.D., Geological Engineering, University of Missouri-Rolla, 1981.
   - M.S., Geology, University of Kentucky, 1978.
   - B.S., Earth Sciences (Geology), National Cheng-Kung University, 1974.
3. Academic experience:
   - University of Alaska Fairbanks, Acting Dean, School of Mineral Engineering and Acting Director, Mineral Industry Research Laboratory, September 1992 – June 1993, full time.
   - University of Alaska Fairbanks, Professor of Geological Engineering, July 1991 – present, full time.
   - University of Alaska Fairbanks, Assistant Professor of Geological Engineering, August 1981 - June 1986, full time.
   - National Cheng Kung University, Visiting Associate Professor, July 1989 - June 1990.
   - Institute of Low Temperature Science, Hokkaido University, Visiting Researcher, June 1989
4. Non-academic experience:
   - GAI Consultants, Inc., Senior Geologist, summer 1980, full time
5. Certifications: None
6. Membership in professional organizations:
   - International Society for Rock Mechanics
   - Association of Engineering Geologists
   - Alaska Miners Association
7. Honors and awards:
   - SINOROCK 2009 Best Paper Award 2009
   - ASCE Best Journal Paper Award in 2004-2005
   - Resolution of Appreciation, Alaska Miners Association, 1993
• Honorable Mention Certificate, Asian Association on Remote Sensing (AARS), 1989

8. Service activities:
   • UAF various committees
   • Reviewer for journals
   • Consulting services to HydroChina International, Japanese National Oil, Gas and Metal Corp and Ministry of Education and Science, ExxonMobil, and Gazprom.

9. List of important publications (past five years)

   23 a) Journals:

   b) Conferences:

1. Name: Paul A. Metz

2. Education
   - Ph.D., DIC in Mining Geology, Imperial College of Science Technology and Medicine, University of London, London, United Kingdom, 1991.
   - M.S., Economic Geology, University of Alaska Fairbanks, 1975
   - B.S., Michigan Technological University, Houghton, Michigan, 1968.

3. Academic experience:
   - University of Alaska Fairbanks, Professor of Geological Engineering, Department of Mining and Geological Engineering, College of Engineering and Mines, University of Alaska Fairbanks, October 2010 – present, full time.
   - University of Alaska Fairbanks, Director, Mineral Industry Research Laboratory, College of Engineering and Mines, October 2006 – October 2010.
   - University of Alaska Fairbanks, Chair, Department of Mining & Geological Engineering, School of Mineral Engineering, July 2001 - July 2005.
   - University of Alaska Fairbanks, Professor of Geological Engineering, Department of Mining and Geological Engineering, July 2000 - July 2005, full time.
   - University of Alaska Fairbanks, Associate Professor of Geological Engineering, Department of Mining and Geological Engineering, School of Mineral Engineering July 1991 - July 2000, full time.
   - University of Alaska Fairbanks, Assistant Professor of Geological Engineering, Department of Mining and Geological Engineering, School of Mineral Engineering, July 1984 - July 1991, full time.

4. Non-academic experience:
   - Fairbanks Exploration Inc., Director, June 1985 – present.

5. Certifications:
   - Certified Professional Geologist, American Institute of Professional Geologists No. 6786
   - Certified Emergency Medical Technician II, State of Alaska No. 95134017
   - Certified Hazardous Materials Technician
• Certified Surface Miner, Mine Safety and Health Administration
• Certified Underground Miner, Mine Safety and Health Administration

6. Membership in professional organizations:
• Alaska Miners Association
• American Institute of Mining, Metallurgical, and Petroleum Engineers (SME)
• American Institute of Professional Geologists, Certification No. CPG 6786
• American Society for Engineering Education
• Association of Engineering Geologists, Chair, Alaska Section
• National Board of Directors, Chair, 2011 Annual Meeting Committee
• Canadian Institute of Mining and Metallurgy (CIM)
• International Association for Mathematical Geology
• Society of Economic Geologists
• Society for Geology Applied to Mineral Deposits

7. Honors and awards:
• Professor of the Year 2001, Awarded by the UAF Student Chapter of the Association of Engineering Geologists
• Professor of the Year 1999, Awarded by the UAF Student Chapter of the Association of Engineering Geologists

8. Service activities:
• UAF various committees
• Geological Consultant to various governmental agencies, Native Regional Corporations, and private industry

9. List of important publications (past five years)

24 a) Journals:

b) Conferences:
• Brooks, C., P. Metz, M. Billmire, D.E. Keefauver, H. Kourous-Harrigan, R.

10. List of recent professional development activities: None.
1. Name: Debasmita Misra

2. Education
   - Ph.D., Biosystems and Agricultural Engineering, University of Minnesota, 1994.
   - B.S., Agricultural Engineering, Orissa University of Agriculture and Technology, India, 1984.

3. Academic experience:
   - University of Alaska Fairbanks, Associate Professor of Geological Engineering, July 2007 – Present, full time.
   - Michigan Technological University, Assistant Professor of Geological Engineering and Adjunct Assistant Professor of Mechanical Engineering and Engineering Mechanics, December 1998 – June 2000, full time.
   - Orissa University of Agriculture and Technology, Assistant Professor of Soil and Water Engineering, 1987, full time.
   - Orissa University of Agriculture and Technology, Lecturer of Soil and Water Engineering, June 1984 – April 1985, full time.

4. Non-academic experience:

5. Certifications: None

6. Membership in professional organizations:
   - Association of Engineering Geologists (AEG)
   - American Society of Agricultural and Biological Engineers (ASABE)
   - American Geophysical Union (AGU)
   - American Water Resources Association (AWRA)

7. Honors and awards:
   - Feist/Schamel Outstanding Undergraduate Advising Award (2009, 2007 and 2006)
   - Platinum Corporate Sponsor Award for outstanding original annual meeting abstract from the Association of Environmental and Engineering Geologists (2008)
   - Certificate of appreciation from the Society of Mining, Metallurgy, and
Exploration, Inc. (SME) in grateful recognition of my leadership as the Chair of the SME Golden Northwest Region (2007)

- Certificate of appreciation for service to the Faculty Senate as Co-Chair of the Unit Criteria Committee (2007)
- Outstanding Paper Award from the Earth and Space Science Informatics group during the fall meeting of American Geophysical Union (2005).

8. Service activities:
- UAF various committees
- Reviewer for journals
- Associate Editor of Soil and Water Division of the Transactions of American Society of Biosystems and Agricultural Engineering (2007 – 2011).
- Chairman of the International Conference on “International Symposium on Erosion and Landscape Evolution” to be held in Anchorage, AK in 2011, sponsored by American Society of Agricultural and Biological Engineering.
- Member of the Scientific Advisory Committee of Prince William Sound Regional Citizens Advisory Council, Alaska

9. List of important publications (past five years)

10. List of recent professional development activities:
- Attended faculty development workshop on iTeach on “Creating Student Learning Communities” (October 16-17, 2010) and “Engaging the Learner” (November 6 – 7, 2010).
- Attended faculty development teleseminar on “Teaching what you don’t know” by Therese Huston, September 21, 2010.
Appendix C – Equipment
The following tables list the major pieces of equipment and software in each of the labs.

<table>
<thead>
<tr>
<th>Laboratory</th>
<th>Functions of Laboratory</th>
<th>Courses Taught</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Computer Lab</td>
<td>A multipurpose lab used by all students of the department</td>
<td>Various MIN &amp; GE courses</td>
</tr>
<tr>
<td>General Geology for Engineers Lab</td>
<td>Mineral and rock identification, topographic and geologic map reading, and air photo interpretation</td>
<td>GE261</td>
</tr>
<tr>
<td>Geomaterial Laboratory</td>
<td>Geological materials engineering</td>
<td>GE365</td>
</tr>
<tr>
<td>GIS Lab</td>
<td>GIS application to geological and mining engineering</td>
<td>GE376</td>
</tr>
<tr>
<td>Exploration Geophysics Lab</td>
<td>Teaching and storage space for the geophysics field equipment</td>
<td>GE405</td>
</tr>
<tr>
<td>Summer Field Methods Equipment</td>
<td>Storage space for field equipment</td>
<td>GE381/382</td>
</tr>
<tr>
<td>Subsurface hydrology Lab</td>
<td>Subsurface groundwater hydrology experiments</td>
<td>GE420</td>
</tr>
<tr>
<td>Remote Sensing Lab</td>
<td>Satellite image processing for geological engineering</td>
<td>GE471</td>
</tr>
<tr>
<td>Mine Surveying Lab</td>
<td>Storage of various surveying equipment</td>
<td>MIN202</td>
</tr>
<tr>
<td>Rock Mechanics Lab</td>
<td>Rock mechanics testing and experiments</td>
<td>MIN370, MIN472 &amp; MIN443</td>
</tr>
<tr>
<td>Rock Drilling and Core Preparation Lab</td>
<td>Drilling tests and experiments and rock sample preparation</td>
<td>MIN370, MIN472 &amp; MIN443</td>
</tr>
<tr>
<td>Mining and GE Design Lab</td>
<td>Computer aided mine designs</td>
<td>GE 480, MIN481, MIN482 &amp; MIN490W</td>
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</table>
Department of Mining and Geological Engineering  
University of Alaska Fairbanks

<table>
<thead>
<tr>
<th>Lab: General Computer Lab</th>
<th>Location: 310 Duckering Building</th>
<th>Room Size: 481 sq. ft.</th>
</tr>
</thead>
</table>

**Description:**
The remote sensing lab is part of a multipurpose computer lab used by all students of the department (Mining and Geological Engineering). A network of 11 PC computers is linked to the UAF domain. There are software packages available for word processing, drawing, and the internet. The lab is shared by students for classes (GE376, GE420, GE440, GE471) that require the use of software packages specific to certain areas such as ArcGIS, Visual Modflow 4.3, gINT, ERMapper, MATLAB, Vulcan 8.0, Rockware, WinGEM2, aRes2d, Grapher, and GeoStudio.

**Major Pieces of Equipment:**
- 11 Dell Optiplex 960 Duo CPU 2.99 GHz
- 1 Overhead projector
- 1 High-capacity networked LaserJet printer Phaser 5500

**Upgrade/Replacement of Lab Equipment Since 2005:**
- Replaced all old computers with the above mentioned computers.
Department of Mining and Geological Engineering  
University of Alaska Fairbanks

| Lab: General Geology for Engineers Laboratory | Location: Room 316 (teaching lab)  
Room 312 (storage); Duckering Building | Room Size: 1,080 sq. ft. |

**Description:**
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 recognize the landforms associated with each of the major geologic processes. The laboratory exercises emphasize landforms in Alaska. The laboratory space is shared with GE 375 and GE 405. The existing space is adequate for only 16 students. With increasing enrollments, three laboratory sections have been needed to accommodate students. If a teaching assistant is not available, the instructor is burdened with an excessive workload.

<table>
<thead>
<tr>
<th>Major Pieces of Equipment:</th>
</tr>
</thead>
</table>
| Common minerals collection  
Rock-forming minerals collection  
Igneous rock collection  
Sedimentary rock collection  
Metamorphic rock collection | Partial set of 1:250,000 scale topographic maps of Alaska  
Partial set of 1:63,360 scale topographic maps of Alaska  
Miscellaneous geologic maps of Alaska  
–5 – Topcon MS-3 Mirror Stereo Scopes  
Miscellaneous air photos of Alaska |

<table>
<thead>
<tr>
<th>Upgrade/Replacement of Lab Equipment Since 2005:</th>
</tr>
</thead>
</table>
| Purchase of partial set of topographic maps and geologic maps  
Replaced some missing mineral and rock specimens as needed |
## Description:
The Geological Materials Lab is used for GE 365 – Geological Materials Engineering, to teach geological engineering students basic soils engineering. Laboratory equipment available to perform testing includes moisture content, sieve analysis, hydrometer analysis, Atterberg limits, standard and modified Proctor compaction, falling and constant head permeability, direct shear, and consolidation testing. Field equipment for soil sampling is also available. This small laboratory space also is used for research purposes. In recent years, class sizes have necessitated breaking up the class into two laboratory sections, as the small room cannot accommodate the entire class at once. If a teaching assistant is not available, the instructor is burdened with an excessive workload.

## Major Pieces of Equipment:
- Automated free-standing direct-shear apparatus
- Partial set of sieves
- Atterberg limits equipment
- Triaxial cell
- 2 –Denver Instruments electronic balances
- Drying oven
- Falling and constant head permeability apparatus (share with subsurface hydrology lab)

## Upgrade/Replacement of Lab Equipment Since 2005:
Purchased automated direct-shear apparatus in 2011; purchased new balances, drying oven, and misc. tools in 2009.
Department of Mining and Geological Engineering  
University of Alaska Fairbanks  

<table>
<thead>
<tr>
<th>Lab: GIS Laboratory</th>
<th>Location: 310 Duckering Building</th>
<th>Room Size: 481 sq. ft.</th>
</tr>
</thead>
</table>

Description:
The GIS lab is a multipurpose lab used by all students of the department (Mining and Geological Engineering). A network of 6 PC computers is linked to the UAF domain. There are software packages available for ArcGIS, word processing, drawing, scanning, and the internet. The lab is shared by students for classes (GE376, GE420, GE471, GE440) that require the use of software packages specific to certain areas such as ArcGIS, Visual Modflow 4.3, gINT, ERMapper, MATLAB, Vulcan 8.0, Rockware, WinGEM2, aRes2d, Grapher, and GeoStudio.

Major Pieces of Equipment:
11 Dell Optiplex 960 Duo CPU 2.99 GHz
1 High-capacity networked LaserJet printer Phaser 5500
1 Overhead projector

Upgrade/Replacement of Lab Equipment Since 2005:
Replaced all old computers with the above mentioned computers
<table>
<thead>
<tr>
<th>Lab: Exploration Geophysics Laboratory</th>
<th>Location: 312 &amp; 316 Duckering Building</th>
<th>Room Size: 1,080 sq. ft.</th>
</tr>
</thead>
</table>

**Description:**
The space designated for the laboratory is shared space with GE 261 and GE 375. The laboratory functions of GE 405 - Exploration Geophysics, are in part completed in the field, depending on weather conditions. Some of laboratory work is conducted in the lecture classroom. The laboratory exercises entail review of the operating procedures for the equipment and field survey plan, and reduction and analysis of data collected in the field or field data collected in previous years. Laboratory survey for each geophysical exploration method listed in the course description takes 3 weeks to complete that include hands-on equipment practice, survey plan design, field survey, and data analysis.

**Major Pieces of Equipment:**
1 – Seistronix RAS-24 seismograph (Seismic)  
1 – Syscal Pro unit (DC Resistivity; on loan from EPSCoR)  
1 – SIRveyor SIR-20 (GPR)  
1 – GEM2 (FDEM)

**Upgrade/Replacement of Lab Equipment Since 2005:**
1 – Seistronix RAS-24 seismograph (Seismic)  
1 – Syscal Pro unit (DC Resistivity)  
1 – SIRveyor SIR-20 (GPR)  
1 – GEM2 (FDEM)
**Lab: Subsurface Hydrology**

<table>
<thead>
<tr>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Major Pieces of Equipment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 1 Bendix barometer recorder</td>
</tr>
<tr>
<td>- 1 soil test piezometer</td>
</tr>
<tr>
<td>- 3 soil test permeameters</td>
</tr>
<tr>
<td>- Upright freezer</td>
</tr>
<tr>
<td>- 3 tensiometers</td>
</tr>
<tr>
<td>- 1 frequency-based piezometer</td>
</tr>
<tr>
<td>- La Motte pH meter</td>
</tr>
<tr>
<td>- Alterberg limits apparatus</td>
</tr>
<tr>
<td>- 1 motorized, free-standing, direct-shear apparatus</td>
</tr>
<tr>
<td>- 1 Mettler electronic balance</td>
</tr>
<tr>
<td>- 2 water level indicators (dipmeter type)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Upgrade/Replacement of Lab Equipment Since 2001:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Vibrating wire piezometer</td>
</tr>
<tr>
<td>- Water level indicator with a 200-ft line and case</td>
</tr>
</tbody>
</table>
Lab: Remote Sensing Lab | Location: 310 Duckering Building | Room Size: 481 sq. ft.

Description:
The remote sensing lab is part of a multipurpose computer lab used by all students of the department (Mining and Geological Engineering). A network of 11 PC computers is linked to the UAF domain. There are software packages available for word processing, drawing, and the internet. The lab is also used by students for classes (GE376, GE420, GE471) that require the use of software packages specific to certain areas such as ERDAS Imagine, ArcGIS, Visual Modflow 4.3, gINT, ERMapper, MATLAB, Vulcan 8.0, Rockware, WinGEM2, and Res2d.

Major Pieces of Equipment:
- 11 Dell Optiplex 960 Duo CPU 2.99 GHz
- 1 Overhead projector
- 1 High-capacity networked LaserJet printer Phaser 5500

Upgrade/Replacement of Lab Equipment Since 2005:
Replaced all old computers with the above computers
### Department of Mining and Geological Engineering
**University of Alaska Fairbanks**

<table>
<thead>
<tr>
<th>Lab: Mine Surveying</th>
<th>Location: 356 Duckering Building</th>
<th>Room Size: 191 sq. ft. (assigned for storage of equipment)</th>
</tr>
</thead>
</table>

**Description:**
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.

**Major Pieces of Equipment:**
- 3 - Total Station Leica TS 06
- 2 - Total Station Leica TC 800  1 – Theodolites (Wild)  2 – Zeiss levels
- 1 – Transit Dietzgen  1 – EDM-1A  1 – EDM-2A
- 2 - Digital Theodolite Leica BUILDER T200
- 4 - Digital Theodolite Leica BUILDER T100  2 – Automatic levels (Lietz)  4 – Transits (1") (Lietz)
- 2 – Engineer's level (Lietz)  1 – Theodolite (Lietz Universal)  5 – Planimeters
- 5 – Transits (various manufacturers)  6 – Tripods and rods
- 2 - Leica GPS System 1200
- 2 - Leica GPS GS 15Trimble 4700 RTK GPS system (2 units)
- Software for plotting and coordinate calculation, SOKKIA

**Upgrade/Replacement of Lab Equipment Since 2005:** New total station
**Department of Mining and Geological Engineering**  
**University of Alaska Fairbanks**

|---------------------|------------------------------------|-----------------------|

**Description:**  
The rock mechanics laboratory is used for conducting experiments and tests on rock and other material samples under various environmental conditions, for both teaching and research purposes.

**Major Pieces of Equipment:**  
Computerized direct shear test apparatus, computerized compressive testing machine (330,000 lb. capacity), computerized compressive testing machine (55,000 lb. capacity), triaxial test cells, environmental chamber with Cincinnati sub-zero refrigeration system (range -85 °F to +180 °F, and relative humidity 20% to 90%), computerized data acquisition/processing system, transmission polariscope, reflection polariscope, 10-channel portable strain indicator, triaxial hydraulic loading frame, point-load tester, flat jack, tape extensometer, rock bolt pull tester, 16-channel data loggers (2), inclinometer and settlement reader, tilt meter, MiniMate Plus seismograph, crack meter, tissue meter, pressure cell, vibrating wire stress meter, borehole extensometer with 3 anchors, magnetic probe extensometer, creep testing machine, Upgrade of computer control/data acquisition system for compressive testing machine (330,000 lb capacity), Ultrasonic Pulse Velocity testing system, and Ultrasonic Tomography testing system.

**Upgrade/Replacement of Lab Equipment Since 2005:**  
1) addition of triaxial cells with different sizes; 2) addition of multi-channel ultrasonic velocity tomography testing system; and 3) addition of a high speed video camera for rock blasting and breakage monitoring.
<table>
<thead>
<tr>
<th>Lab: Rock Drilling and Rock Core Preparation</th>
<th>Location: 141 Duckering Building</th>
<th>Room Size: 598 sq. ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The rock drilling and rock core preparation laboratory is used for rock drilling tests and experiments. It is also used for rock core specimens preparation for conducting experiments and tests in the rock mechanics laboratory.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major Pieces of Equipment:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two rock coring machines, two rock saws, a rock surface grinding machine, and sensors and data loggers for drilling torque, penetration rate and thrust.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upgrade/Replacement of Lab Equipment Since 2005: 1) addition of new rock coring machine; and 2) addition of new rock core cutting machine.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Department of Mining and Geological Engineering
#### University of Alaska Fairbanks

<table>
<thead>
<tr>
<th>Lab: Mining and GE Design Laboratory</th>
<th>Location: 318 Duckering Building</th>
<th>Room Size: 292 sq. ft.</th>
</tr>
</thead>
</table>

**Description:**
This laboratory was established for use by senior and graduate mining and geological engineering students for computer aided design work. It is also used to teach courses such as MIN 481 and 482 that require use of design software.

**Major Pieces of Equipment:**
- 5 Dell Optiplex 760

**Upgrade/Replacement of Lab Equipment Since 2005:**

<table>
<thead>
<tr>
<th>All old equipment replaced with the below</th>
<th>Major Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 5 Dell Optiplex 760 Intel Duo CPU 3.32 GHz</td>
<td>- VULCAN 7.5</td>
</tr>
<tr>
<td>- 30 inches screen</td>
<td>- GEorient</td>
</tr>
</tbody>
</table>

- ArcGIS 9.2
- RockPack
- MATLAB
- MS Visual Studio 2008
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.
      Scott L. Huang, Professor, 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

University of Alaska President

Chancellor UAA, Anchorage
Chancellor UAF, Fairbanks
Chancellor UAS, Juneau

Prevost & Executive Vice Chancellor Academic Affairs
Vice Chancellor Research
Vice Chancellor Administrative Services
Vice Chancellor Students
Vice Chancellor Rural, Community & Native Education
Vice Chancellor University Advancement

2 Vice Provosts, 3 Deans and 6 Academic Directors

Associate Dean for Academics
INE Director - Associate Dean for Research
Chief Fiscal Officer
Academic Manager

Department Chairs:
Civil & Environmental Engr
Computer Science
Electrical & Computer Engr
Mechanical Engr
Mining & Geological Engr
Petroleum Engr
and Academic Faculty

Department Office Managers
Dean's Office Assistant


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, Anthony Rickard, Mathematics and Statistics Department Chair
Physics, Ataur Chowdhury, Physics Department Chair
English, Rich Carr, English 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.

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>
<thead>
<tr>
<th>Academic Year</th>
<th>Enrollment Year</th>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>5th</th>
<th>Total Undergrad</th>
<th>Total Grad</th>
<th>Degrees Awarded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Year</td>
<td>FT 7-11</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>14</td>
<td></td>
<td>35</td>
<td>5</td>
<td>0 8 1 1</td>
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<tr>
<td></td>
<td>PT 4</td>
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<td>4</td>
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<td>3</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>FT 7-10</td>
<td>7</td>
<td>4</td>
<td>8</td>
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<tr>
<td>2</td>
<td>FT 6-09</td>
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<td>PT 0</td>
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<td>0</td>
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<td>4</td>
<td></td>
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<tr>
<td>3</td>
<td>FT 6-08</td>
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<td></td>
<td>16</td>
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<tr>
<td></td>
<td>PT 0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td></td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

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

Geological Engineering

Year: 2010-11

<table>
<thead>
<tr>
<th>Head Count</th>
<th>FTE²</th>
</tr>
</thead>
<tbody>
<tr>
<td>FT</td>
<td>PT</td>
</tr>
</tbody>
</table>

- **Administrative³**
- **Faculty (tenure-track)**: 4
- **Other Faculty (excluding student Assistants)**
- **Student Teaching Assistants**: 2
- **Student Research Assistants**: 5
- **Technicians/Specialists**
- **Office/Clerical Employees**: 1
- **Others⁴**

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.
Signature Attesting to Compliance

By signing below, I attest to the following:

That the B.S. Geological 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.

____________________________
Dean’s Name (As indicated on the RFE)

__________________________
Signature       Date

June 24, 2011
Date