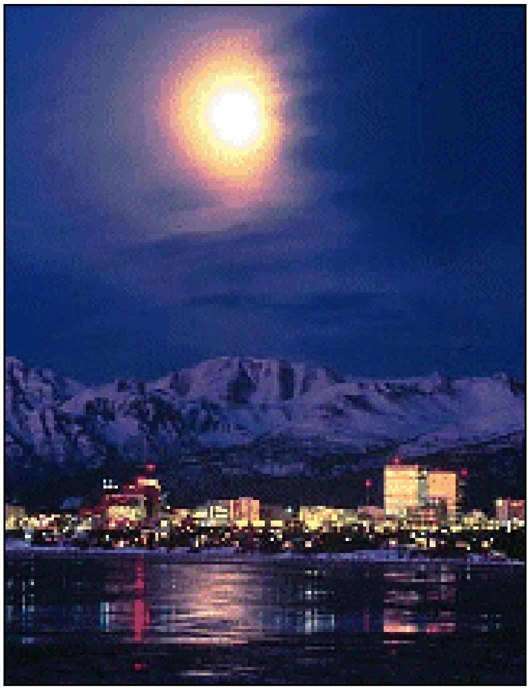
Arctic Engineering
GRADUATE STUDENT HANDBOOK

Guidelines for Students
in the University of Alaska Anchorage
Arctic Engineering Graduate Program



UAA
UNIVERSITY of ALASKA ANCHORAGE

School of Engineering, Engineering Building, Room 201, 3211 Providence Dr., Anchorage, AK 99508; 907-786-1900; ***www.engr.uaa.alaska.edu/ae/***

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Revised 23 February 2004

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ARCTIC ENGINEERING
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Guidelines for Arctic Engineering Graduate Students
University of Alaska Anchorage

Why Study Arctic Engineering?

As the 21st century world turns to the north for mineral resources and global supply logistics, a sustained demand exists for engineers in commercial and public service who are trained to solve problems in cold regions. The UAA Arctic Engineering program of graduate studies provides a specialized curriculum to prepare professionals for:

- Development of cold regions natural resources,
- Multi-modal transportation improvements in cold regions,
- Design and operation of constructed works in rural communities and winter cities, where snow, ice, and frozen ground constrain effectiveness of conventional methods, and
- Evaluation of climate change impacts on northern infrastructure.

Climate models consistently show that Arctic regions of the world are most sensitive to global warming. Recent scientific findings indicate that physical characteristics of the Arctic atmosphere, ocean, and land have been changing since the 1970s. Precise records of the 1990's show acceleration of these changes. As a result, Arctic research has growing national and global importance.

The UAA School of Engineering has responded to these trends with a series of new research initiatives aimed at evaluation of and response to climate change impacts on infrastructure in cold regions. UAA Arctic Engineering faculty members are leaders of national and international efforts to prepare civilization in the north for the changes of this millennium.

UAA enjoys a close association with the US Army Cold Regions Research and Engineering Laboratory (CRREL), whose headquarters are in Hanover, New Hampshire, with offices in Anchorage and Fairbanks. The University and CRREL began an educational partnership in June 2000 that allows CRREL research scientists and engineers to participate in UAA educational programs. CRREL Affiliate faculty members have developed several of the specialized graduate engineering courses of the UAA Arctic Engineering program. Students enrolled in the Arctic Engineering program of graduate studies at UAA benefit from the depth of knowledge that comes from CRREL and UAA research, whether they reside in Anchorage or use online learning resources from afar.

Arctic Engineering at UAA

The Masters of Science in Arctic Engineering degree curriculum is designed to provide graduate education via the World Wide Web for engineers who must deal with the unique challenge of design, construction, and operations in the cold regions of the world. Special problems created by the climatic, geological and logistical conditions of the Arctic and sub-Arctic require knowledge and techniques that are rarely presented in conventional engineering courses. A thorough knowledge of heat transfer processes and properties of frozen ground and frozen water is basic to most engineering activities in the cold regions. The subject areas of hydraulics, hydrology, materials and utility operations are also uniquely affected by Arctic considerations. The Arctic Engineering program requires completion of a set of core courses that will prepare an engineer to understand and adapt prior engineering knowledge and skills to problems of cold regions. The program also allows students to study advanced elective courses in a particular area of specialized interest. Research activities carried out by faculty of the UAA School of Engineering provide opportunities for project reports dealing with current Arctic knowledge. A graduate Advisory Committee composed of at least three members, the Chair and one other members of which must be UAA Arctic Engineering faculty, is appointed to guide each admitted student to degree completion. Additional program guidance is available via the URL referenced above.

On successful completion of the program, students will have gained sufficient knowledge to:

1. Recognize natural conditions and engineering challenges that are unique to cold regions,
2. Interpret associated specialized language and units of measure,
3. Locate, interpret, and apply public information about cold regions physical conditions,
4. Apply fundamental physical principles for solutions to common cold regions engineering problems,
5. Assess need for complex specialized Arctic engineering solutions,
6. Determine physical and thermal properties, evaluate frost heave rates, and estimate heat flow in soils, prevent foundation failure due to seasonally frozen ground or permafrost by appropriate project site exploration and design of constructed features,
7. Determine mathematical and physical properties governing heat and mass transfer in cold climates,
8. Determine temperature profiles in structure walls, roof, and foundations, predict moisture content and mass flow rates in structures,
9. Acquire, integrate, and interpret data from public archives regarding site conditions associated with planning and design of community utility systems and formulate field measurement programs to determine site conditions for planning and design,
10. Analyze properties of lake, river, and sea ice, predict behavior of ice under natural conditions, and predict ice forces on engineering structures, and
11. Apply the sum of specialized Arctic engineering knowledge and skills gained in the program toward solution of a practical engineering problem and report this to fellow specialists.

Admission to the Arctic Engineering Program at UAA

Students who have earned or have nearly completed a baccalaureate degree in an engineering discipline from an ABET[1]- accredited engineering program in the United States, or a foreign equivalent, may apply for admission to the Arctic Engineering graduate program. Letters of recommendation from professors or others particularly qualified to attest to the applicant's qualifications and other information indicative of the applicant's potential for graduate study may be enclosed with the application. Admission is granted to applicants who have received their baccalaureate degree with a cumulative GPA of at least 2.5 and whose credentials indicate their ability to successfully complete engineering graduate studies. Up to 9 semester credits not previously used to obtain any other degree or certificate may be transferred to UAA from a regionally accredited institution and accepted toward a graduate degree or certificate. Quarter credits will be converted to semester credits by multiplying quarter credits by two-thirds. Acceptance of transfer credits toward program requirements is at the discretion of the student's Graduate Studies Committee (see Advancement to Candidacy). Admitted students are responsible for completion of prerequisites for Arctic Engineering program courses, which may not have been included in their undergraduate education. No more than nine (9) credits may be completed in the student's graduate program before application for admission.

Applications for admission to UAA graduate programs are submitted online via: http://www.uaa.alaska.edu/enroll/catalog/app1.html. Applications will not be processed without the $45 processing fee. Applications may be filled out on-line and submitted with credit card payment or you may choose to fill out the application on-line, print and submit with a check or money order to:

> Enrollment Services, University of Alaska Anchorage, 3211 Providence Drive, Anchorage, AK 99508-8046

If you do not have a social security number, you must print the application and submit with check or money order via mail.

The following documents are required to be submitted with the application:

1. Official transcript(s), reflecting graduate level credits and credits pertaining to the baccalaureate degree, from each institution attended. Transcripts are to be requested by the student and must be submitted in an officially sealed envelope.

2. Scores from the Test of English as a Foreign Language (TOEFL) if English is not the applicant's native language or was not the language of instruction for the applicant's baccalaureate degree. TOEFL may be waived if the applicant has been a long-term resident of the United States or of another English-speaking country.

[1] Accreditation Bureau for Engineering and Technology

3. Prior to being accepted, an applicant with a transcript from an institution outside the United States or Canada must provide an official statement of equivalency from a recommended credentials evaluation service and, if necessary, an English translation of the transcript. A fee is normally required by the evaluation service and is paid directly to them. The amount varies depending upon the type and complexity of the evaluation.

International students who wish to transfer college-level course work from international institutions must submit official transcripts and English translations (if necessary) as well as an official statement of educational equivalency from a recommended international credentials evaluation service. Lists of such services may be obtained from Enrollment Services. Fees depend upon the type and complexity of the evaluation. Other guidance for international students is available at: http://www.uaa.alaska.edu/enroll/catalog/app1.html

Upon receipt of the required information, UAA Enrollment Services will forward each student's admission packet to the Dean of the UAA School of Engineering for consideration. All of these materials become the property of UAA and are only released or copied for use within the University of Alaska system. The acceptance decision is made by the Dean and the Chair of the Arctic Engineering Program, who inform Enrollment Services of the decision. Enrollment Services sends an official Certificate of Admission directly to the applicant. The Chair of the Arctic Engineering Program appoints a Graduate Advisor for each student accepted to the program, who will contact the student at the time of admission. Admission to the Arctic Engineering graduate program does not establish candidacy (see Advancement to Candidacy). Continuous registration is expected every fall and spring semester, from admission through graduation, until all requirements for the degree are completed. To make continuous progress in their graduate program, students have the option of registering for at least one (1) graduate level credit applicable to their graduate degree or paying the continuous registration fee that will allow students to remain active in the graduate program although not registered in any courses.

Registration for Classes

Students register for classes online via the WolfLink at http://www.uaa.alaska.edu/. Registrants must submit a Registration Access form (see Appendix C), which will provide the student with an id and password for access to the WolfLink system. A delay of up to two days may occur during peak registration periods. Registered students may use the UAA email system, accessible at http://webmail.uaa.alaska.edu. Online classes are accessed with the same id and password via the UAA Blackboard system at: http://uaaonline.alaska.edu/.

Advancement to Candidacy

After demonstrating an ability to succeed in graduate study by successfully completing nine (9) graduate credits toward the degree program, the student may apply for advancement to candidacy. Advancement to candidacy status is a prerequisite to graduation and is determined by the Dean and Chair of the Arctic Engineering program. Candidacy is the point in a graduate study program at which the student has demonstrated an ability to master the subject matter in the program and has progressed to the level at which a graduate studies plan can be approved. To be approved for candidacy a student must:

1. Satisfy all terms of a conditional admission,
2. Submit an approved Official Graduate Studies Plan,
3. Have maintained a 3.00 (B) GPA in all course work that meets their graduate program requirements,
4. Demonstrate competence in the methods and techniques of the discipline,
5. Satisfy all prerequisites and remove all academic deficiencies, and
6. Receive approval of the Arctic Engineering project proposal from the student's Graduate Studies Committee.

Graduate Studies Plan. The Graduate Studies Plan, presented as part of application for advancement to candidacy, formally establishes the specific program requirements which will, upon satisfactory completion, entitle the student to receive the Master of Science degree in Arctic Engineering. The plan is based upon the catalog requirements for the graduate degree and becomes official once it is approved by the Chair of the Arctic Engineering program and the Dean of the School of Engineering and filed with UAA Enrollment Services. Students are expected to complete all requirements listed on their approved Graduate Studies Plan. Any revision to the plan will need to be submitted to Enrollment Services with prior approval of the student's Graduate Studies Committee.

Graduate Studies Committee. The Graduate Advisor typically acts as Chair of the student's Graduate Studies Committee. The advisor and the student select a Graduate Studies Committee as part of the process of advancement to candidacy. The committee must consist of at least 3 members. Two must be UAA School of Engineering full-time faculty members including the chair. One committee member may be from a discipline outside the School of Engineering and may be an Adjunct or Affiliate UAA Professor. Additional members who are not UAA faculty, but have appropriate professional credentials, may be included with the approval of the Arctic Engineering program Chair, the committee chair, and the student. The student may select an outside reviewer approved by the Dean or designee of the program to participate in the review of the project written report and oral presentation to assure that the process is fair and appropriate. The outside reviewer is a faculty member from another department in the university or other qualified individual in the area in which the student is seeking their degree. The committee members and chair must agree to serve and must be approved by the Arctic Engineering program Chair. Any changes to the committee structure require the approval of the Arctic Engineering program Chair and the committee chair.

The graduate advisor and committee will:

1. Review the graduate student's Graduate Studies Plan, insuring that it includes
    a. All UAA requirements,
    b. All courses required for the degree,
    c. An appropriate Arctic engineering project,
    d. A written project report and oral project defense, and

    e. Arrangements to remove any deficiencies in the student's academic background.
2. Approve the Graduate Studies Plan and at the time of advancement to candidacy.
3. Monitor the student's progress and timely completion of all requirements in the Official Graduate Studies Plan (see Continuous Registration).
4. Monitor the timely submission of the Official Graduate Studies Plan and other documents to Enrollment Services.
5. Review and approve any changes to the Official Graduate Studies Plan, directing timely submission of the revised plan to Enrollment Services.
6. Review and approve the Arctic Engineering project, including initial proposal.
7. Review, and approve requests for temporary leaves of absence which, if approved, will result in the student being placed on inactive status.
8. Administer and assess the project defense.

UAA Graduation Requirements

Candidates must submit an Application for Graduation with the application fee to Enrollment Services no later than the end of week two of the semester in which they intend to graduate. Applications received after the deadline will be processed for the following semester. Students who apply for graduation but do not complete degree requirements by the end of the semester must re-apply for graduation. The application fee must be paid with each Application for Graduation.

Applicable UAA and School of Engineering requirements for graduate degrees are:

1. A Grade Point Average (GPA) of at least 3.00 (B) must be earned in courses identified in the Official Graduate Studies Plan.
2. Only 400- and 600-level courses approved by the graduate student's Graduate Studies Committee may be counted toward graduate program requirements.
3. In 400-level courses, a minimum grade of "B" is required for the course to count toward the program requirements.
4. UAA courses at the 500-level are for professional development and are not applicable toward any degree.
5. In 600-level courses, a grade of "C" is minimally acceptable, provided the student maintains a cumulative GPA of 3.00 (B) in all courses applicable to the graduate program. At least 21 credits must be taken at the graduate level (600) for any master's degree, including thesis and research credits. For performance comparison only, in 600-level courses a grade of "P" (Pass) is equivalent to a B or higher, but does not enter into the GPA calculation.
6. Up to 9 semester credits not used toward any other degree or certificate may be transferred to UAA from an accredited institution and counted toward a degree or certificate. Quarter credits will be converted to semester credits by multiplying quarter credits by two-thirds. Acceptance of transfer credit toward program requirements is at the discretion of the individual program.

7. The Dean of the School of Engineering may allow credit earned at other universities in the Statewide system (*i.e.*, University of Alaska Fairbanks and University of Alaska Southeast), excluding thesis credit and credit used toward another degree or certificate, to be transferred to UAA, as long as at least nine credits applicable to the student's program are earned at UAA after acceptance into the program.
8. Courses taken by credit by examination or graded Credit/No Credit (CR/NC) do not count toward graduate program requirements. They may, however, be used to satisfy prerequisites or to establish competency in a subject, thus allowing the advisor or committee to waive certain courses in an established program, as long as the total credits in the program remain the same.
9. All credits counted toward the degree or certificate, including transfer credits, must be earned within the consecutive seven-year period prior to graduation.
10. If the requirements for a master's degree as specified in the UAA catalog at the time of program admission are not met within 7 years of formal acceptance into the program, that program will expire and the student must reapply for admission and meet the requirements in effect at the time of formal acceptance.
11. Students are expected to be continuously registered throughout their graduate program.
12. The project report must meet the general UAA requirements for format as determined by the UAA Consortium Library.

Master of Science in Arctic Engineering, Program Requirements

1. A total 30 credits are required for the degree.
2. Candidates must complete the following core courses (9 credits):
    a. CE A603 Arctic Engineering (3),
    b. CE A681 Frozen Ground Engineering (3), and
    c. ME A685 Arctic Heat and Mass Transfer (3).
3. Candidates must also complete at least 3 additional courses (9 credits) from the following Arctic Engineering program elective courses:
    a. CE A682 Ice Engineering (3),
    b. CE A683 Arctic Hydrology and Hydraulic Engineering(3),
    c. CE A684 Arctic Utility Distribution(3),
    d. ME A687 Arctic Materials Engineering (3), and
    e. CE A688 Snow Engineering (3).
4. Candidates must complete additional graduate electives (9 credits) in mathematical, science, or engineering subjects related to or supportive of the student's program of study, as approved by the student's Graduate Studies Committee to fulfill the minimum 30-credit degree requirement. One technical undergraduate elective course at the "400" level may be applicable with prior permission of the student's Graduate Studies Committee and provided a grade of "B" or better is achieved. All course work applied toward degree requirements must be approved by the student's Graduate Studies Committee

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5. Each student must complete the following course (3 credits) after Advancement to Candidacy is approved by their Graduate Studies Committee. Advancement to Candidacy requires prior approval of a project proposal by the student's Graduate Studies Committee:
   a. CE A686 Engineering Project (3)
      1) The Arctic Engineering project must solve a practical engineering problem to the extent that original developments by the candidate are evident in the project report.
      2) The project problem and solution must be presented in the context of the current state of the art by means of a thorough review of pertinent literature.
      3) The project must include innovative components directly involving cold regions engineering.
      4) The project must have sufficient scope to clearly demonstrate the candidate's advanced technical expertise in cold regions engineering.
      5) The project report must demonstrate command of knowledge and skills directly associated with the candidate's graduate program of study.
      6) The project proposal, submitted for advancement to candidacy, must present evidence that the above requirements will be satisfied and will generally consist of an introduction with an explicit problem statement, a literature review, and one or more sections describing the information and analytical methods to be applied.
      7) The written project report, in the judgment of the candidate's Advisory Committee, must be publishable in the proceedings of a cold regions engineering specialty conference.
      8) The work must require a level of effort consistent with three semester hours of credit (approximately 45 to 60 hours per credit hour or 135 to 180 hours total effort).

Financial Assistance Opportunities

Tuition waivers. The UAA School of Engineering has a limited number of graduate tuition waivers that may be awarded on a competitive basis to students whose academic performance and financial circumstances warrant assistance. Applications for tuition waivers are generally due by two weeks after the start of classes for Fall semester and Spring semester. Specific deadlines are posted on the School of Engineering website: http://www.engr.uaa.alaska.edu/soe/.

Teaching Assistantships. The UAA School of Engineering has a limited number of Teaching Assistantships for students residing in Anchorage that require up to 10 hours per week of assistance to undergraduate instructors with grading papers, laboratory preparations, laboratory teaching, and tutoring. Hourly pay is on the order of $12.00 - 13.50 per hour (as of July 2003). Applications for teaching are generally due by two weeks after the start of classes for Fall semester and Spring semester. Specific deadlines are posted on the School of Engineering website: http://www.engr.uaa.alaska.edu/soe/
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Research Assistantships. Faculty and research staff of the School of Engineering typically have research grant support available for graduate students to assist with laboratory or field measurements, data analysis, numerical simulations, and related aspects of academic research projects. The number and type of research projects varies from time to time. Informal inquiries to the Dean, Program Chairs, or individual faculty are the best way to start applying for research assistantships. Notices are also posted on the School web site at http://www.engr.uaa.alaska.edu/soe/. Graduate students who have advanced to candidacy are typically more competitive for research assistantships.

Fellowships. The University of Alaska Anchorage is a qualified National Science Foundation "EPSCoR" (Experimental Program to Stimulate Competitive Research) campus. As such, graduate student fellowships for approximately $17,000 annual stipend are competitively awarded each year to UAA graduate students in science and engineering. Applications for EPSCoR fellowship must be endorsed by a UAA faculty member and must be focused on subjects specified by the EPSCoR program (http://www.alaska.edu/epscor/). Other federal and State agencies also offer fellowship opportunities, some of which will be posted on the School of Engineering web site. All UAA graduate students are encouraged to apply.

Other financial aid. A variety financial aid programs, including college loans, are administered through the UAA Student Financial Aid office. More information is available at http://www.uaa.alaska.edu/finaid/.

Arctic Engineering Faculty

- Orson Smith, PE, Ph.D., Professor, Chair, afops@uaa.alaska.edu
  - Port and coastal engineering in cold regions
- T. Bart Quimby, PE, Ph.D., Professor, aftbq@uaa.alaska.edu
  - Arctic buildings
- Hannele Zubeck, PE, Ph.D., Associate Professor, afhkz@uaa.alaska.edu
  - Frozen ground and pavements in cold regions
- Grant Baker, PE, Ph.D., Associate Professor, afgcb@uaa.alaska.edu
  - Arctic materials and heat and mass transfer
- Jon Zufelt, PE, Ph.D., Adjunct Professor, jon.e.zufelt@erdc.usace.army.mil
  - Ice and river engineering in cold regions
- Dan Schubert, PE, Adjunct Professor, dan_s@gvjones.com
  - Arctic and rural Alaska utilities
- Stephen Daly, Ph.D., Affiliate Professor, sfdaly@crrel.usace.army.mil
  - River and ice engineering
- Jerome Johnson, Ph.D., Affiliate Professor, jjohnson@crrel.usace.army.mil
  - Snow engineering
- Matthew Sturm, Ph.D., Affiliate Professor, msturm@crrel.usace.army.mil
  - Snow engineering

APPENDIX A

ARCTIC ENGINEERING PROGRAM

COURSE SUMMARIES

COURSE CONTENT GUIDE

CE 603 ARCTIC ENGINEERING

I. Course Description

Application of engineering fundamentals to problems of advancing civilization in polar regions. Logistics, foundations on frozen ground and ice, thermal aspects of structures, materials, transport, and communications, heating and ventilating.

II. Course Design

A. Course Intent:

B. Three credit hours

C. Student Involvement

1. 3 lecture hours per week
2. 0 lab hours per week
3. 90 hours expected outside class

D. Elective for BSCE.

E. Materials fee: $5

F. N/A

G. N/A

H. N/A

III. Course Activities

IV. Prerequisites

Graduate standing or faculty permission.

V. Evaluation procedures will be discussed during the first class meeting.

VI. Course Outline

1. Descriptive and Geotechnical Aspects
2. Basics of Heat Transfer
3. Building Design Consideration

4. Air Infiltration And Water Vapor Considerations
5. Ice Growth on Water Surfaces
6. Physical and Thermal Properties of Frozen Ground
7. Depth of Freeze and Thaw in Soils
8. MIDTERM EXAM
9. Foundation Design
10. Glaciology
11. Ice Mechanics
12. Environmental Concerns and Utility Design in Cold
13. Thanksgiving Holiday
14. Low Temperature Effects on Materials and Personnel
15. Miscellaneous Topics
16. Final Exam

CE A681 Frozen Ground Engineering (web-based)

COURSE CONTENT GUIDE
University of Alaska Anchorage, School of Engineering

Date initiated: 10/21/02 **Date revised: NA**

Course title: Frozen Ground Engineering **Course number**: CE A681

Credits: 3.0 **CEU's**: **Course duration**: 15 week semester

Contact hours: Information in the format of narrated PowerPoint presentations, short videos, and other online study aids are presented in weekly, each requiring an average two hours to review. Required online interaction with instructor and other students requires an additional one hour average weekly, for a total course contact equivalent of 45 hours.

Programs: Arctic and Civil Engineering **Grading basis**: A - F

Course Description:

Course registration restrictions: Graduate standing, with a baccalaureate degree in engineering, or upper class standing in an accredited undergraduate program in engineering.

Course prerequisites: CE A435 Soil Mechanics or equivalent training and experience in soil mechanics. Equivalent training and experience will be verified with a test at the beginning of the semester.

Fee amount: $38 (or current UAA distance delivery fee)

I. Instructional Goals and Student Outcomes.

A. **Instructional Goals**: This course is designed to give senior or graduate civil engineering students ability to analyze properties of frozen soils, analyze frozen soil's behavior under stress and strain and to design foundations, frozen structures and pavements for frozen ground.

B. **Student Outcomes**: On successful completion of the course, students will have:

1. Ability to determine physical and thermal properties of frozen soils.
2. Ability to evaluate frost heave rates of frozen soils.
3. Ability to estimate heat flow in soils.
4. Understanding of thaw weakening of frozen soils and ability to estimate thaw settlement.

5. Ability to estimate strength and creep parameters of frozen soils.
6. Ability to design construction ground freezing project.
7. Ability to prevent foundation failure due to seasonally frozen ground or permafrost.
8. Ability to prevent pavement failure due to frost action.
9. Ability to identify important issues in earthwork, field investigations and slope stability for frozen or thawing ground.
10. Improved ability to function in teams.
11. Improved ability to communicate effectively.

II. Guidelines for evaluation

A. **Practice exams**: Students will complete automatically graded practice exams for which multiple attempts will be allowed. In other words, they will have the opportunity to correct wrong answers from their initial attempt. Problems on the practice exams will be akin to conventional homework assignments and problems in the Final Exam.
B. **Homework assignments**: Students may also be required to perform computations and to interpret data and other information about cold regions in electronic file "e-homework" submittals.
C. **Guided discussions**: A variety of opportunities will be provided for students to participate in guided discussions on frozen ground engineering topics. Discussions will be primarily among students on topics provided by the instructor. Groups will be assigned hypothetical problems and will report their conclusions to the instructor. All discussions will be available for viewing by all enrolled students.
D. **Term paper conference**: Students will prepare a Call for Papers, Conference Program with virtual sessions, submit the term paper, act as peer reviewers, read posted papers of their interest and discuss them on Discussion Board.
E. **Exams**: A midterm and final exam will be administered online for which only one attempt at correct answers will be allowed. Students will be required to explicitly vouch for their academic honesty on the exam.

III. Course level justification

A. The primary context of the course will be discussion among professional peers on advanced technical topics, with the basic assumption that students are accustomed to this level of interaction.
B. Presentations and reading will include advanced scientific and engineering topics that require for complete interpretation a background in math and science equivalent to that of bachelors degree programs in engineering.
C. Significant responsibility for independent critical thinking, efficient learning habits, and interpretation of technical information will fall on the student, at a level commonly associated with graduate education.

D. Typical course outline

A. **Course Introduction**. Instructor(s) describe the sequence of the course presentations and expectations for successful learning in the online mode of information exchange. Frozen Ground issues are introduced.

B. **Physical and Thermal Properties of Soils.** Review "weight-volume" relationships and density of water and ice, define water content and iceness ratio of frozen soil, describe cooling curve for soil water and ice, classify frozen soils, estimate unfrozen water content, evaluate effects of solutes, define and estimate thermal conductivity, heat capacity, thermal diffusivity, latent heat of fusion and thermal expansion of frozen and unfrozen soils.

C. **Frost Action.** Describe theories of frost action process, list factors affecting frost heave, classify frost susceptibility of soils, describe frost heave tests, describe and calculate Segregation Potential, estimate the quantity of frost heave, estimate frost heave forces, evaluate freeze-thaw effects on permeability.

D. **Heat Flow in Soils.** Review/define freezing and thawing indices, n-factor, understand Stefan's equation and modified Berggren equation in estimation of frost depth, estimate the depth of freezing and thawing for one and multi-layer system, estimate temperatures below cooled (or heated) areas with steady state heat flow.

E. **Thaw Behavior of Frozen Ground.** Understand the origin of the thaw settlement, estimate thaw settlement with consolidation test results, with dry densities or frozen bulk density, estimate excess pore water pressure during thawing, estimate the magnitude and time rate of thaw settlement in one layer system.

F. **Mechanical Properties of Frozen Soils.** Understand primary, secondary and tertiary creep, estimate creep strain, creep deformation and long-term strength of frozen soils, analyze laboratory creep results.

G. **Foundations in Frozen Ground.** Understand considerations for foundations in seasonally frozen ground, design insulation for seasonally frozen ground, understand considerations for foundations in permafrost, design of "shallow" and "deep" foundations on permafrost, design of piles in permafrost, understand principles of thermo siphons.

H. **Construction Ground Freezing.** Understand design considerations, list different freezing methods, design frozen walls, understand construction considerations

I. **Pavement Design.** Understand challenges due to the cold environment on roads and airfields, select proper materials, reduce problems with proper design, use proper construction techniques.

J. **Earthwork, Slope Stability, and Field Investigations**. Collection of important issues that are specific for frozen ground.

K. **Term Paper Conference.** Peer reviewed term papers are posted in virtual conference sessions and discussed at Discussion Board.

IV. Suggested text and bibliography

A. Suggested Text

O. Andersland and B. Ladanyi. 1985. An Introduction to Frozen Ground

Engineering, Chapman & Hall

B. Bibliography

1. Eranti, E., and Lee, G., 2000. Cold Region Structural Engineering, McGraw-Hill, NY,
2. McFadden, T., and Bennett, F., 1991. Construction in Cold Regions – A Guide for Planners, Engineers, Contractors, and Managers, John Wiley & Sons, Inc., NY,
3. Rice, Eb, 1996. "Building in the North," Alaska Science and Technology Foundation, Anchorage
4. Smith, D. W., ed., 1996. Cold Regions Utilities Monograph, 3rd ed., Technical Council on Cold Regions Engineering Monograph, American Society of Civil Engineers

CE A682 Ice Engineering (web-based)

COURSE CONTENT GUIDE
University of Alaska Anchorage, School of Engineering

Date initiated: 4 November 2002 **Date revised:**

Course title: Ice Engineering **Course number**: CE A682

Credits: 3.0 **CEU's**: **Course duration**: 15 week semester

Contact hours: Information in the format of narrated PowerPoint presentations, short videos, and other online study aids are presented in weekly, each requiring an average two hours to review. Required online guided discussions and other interactions with the instructor and other students requires an additional one hour average weekly, for 3.0 hours per week or 3 hours/week * 15 weeks = 45 hours total contact time.

Programs: Arctic and Civil Engineering **Grading basis**: A - F

Course Description: Factors are reviewed governing design of engineering works which must contend with the presence of ice. Topics discussed include fundamental ice properties, river, lake, and sea ice processes, ice navigation and control of ice in channels, structural and non-structural ice control measures, ice jams, bearing capacity of floating ice sheets, ice forces on riverine and ocean structures.

Course registration restrictions: Graduate standing, with a baccalaureate degree in engineering, or upper class standing in an accredited undergraduate program in engineering.

Course prerequisites: ES A331 Mechanics of Materials or equivalent

Fee amount: $38 (or current UAA distance delivery fee)

I. Instructional Goals and Student Outcomes.

A. **Instructional Goals**: Instructors will present materials, lead discussions, and assign exercises intended to give senior or graduate civil engineering students ability to analyze properties of lake, river, and sea ice, predict behavior of ice under natural conditions, predict ice forces on engineering structures, design ice roads and bridges, evaluate bearing capacity of ice sheets, and predict other ice effects pertinent to safety and efficiency of human endeavors in cold regions.

B. **Student Outcomes**: On successful completion of the course, students will have developed knowledge and skills to:

1. analyze properties of lake, river, and sea ice,
2. predict behavior of ice under natural conditions,
3. predict ice forces on engineering structures,
4. design ice roads and bridges,
5. evaluate bearing capacity of ice sheets,
6. design ice control and ice jam mitigation measures, and
7. predict other ice effects pertinent to safety and efficiency of human endeavors in cold regions.

II. Guidelines for evaluation

A. **Homework assignments**: Students are required to perform computations and to interpret data and other information about lake, river, and sea ice properties, behavior, and related effects on offshore or waterfront structures.

B. **Term Project and Report**: A realistic practical ice engineering problem is assigned requiring students to assess the nature of the problem, retrieve appropriate data, perform analyses and simulations, and plan offshore or waterfront engineering works in ice.

C. Midterm and Final Exams: A midterm and a comprehensive final exam will be administered online for which only one attempt at correct answers will be allowed. Students will be required to explicitly vouch for their academic honesty on the exam.

III. Course level justification

A. The primary context of the course will be discussion among professional peers on advanced technical topics, with the basic assumption that students are accustomed to this level of interaction.

B. Presentations and reading will include advanced scientific and engineering topics that require for complete interpretation a background in math and science equivalent to that of bachelors degree programs in engineering.

C. Significant responsibility for independent critical thinking, efficient learning habits, and interpretation of technical information will fall on the student, at a level commonly associated with graduate education.

IV. Typical course outline

A. Introduction to Physical Ice Properties and Processes
B. River, Lake, and Sea Ice
C. Ice Navigation and Control of Ice in Channels
D. Structural and non-structural ice control measures
E. Ice Jam Processes and Classification
F. Ice Jam Data Collection , Hydraulics, and Mitigation
G. Bearing Capacity of Floating Ice Sheets
H. Ice Forces on Structures and Related Processes

V. Suggested text and bibliography

A. Suggested text

USACE, 1999. "Ice Engineering," EM 1110-2-1612, US Army Corps of Engineers, Washington, DC

B. Bibliography

1. Ashton, G. D., ed., 1986. River and Lake Ice Engineering, Water Resources Publications, Littleton, CO
2. ANSI/API, 1993. "Recommended Practice for Planning, Designing, and Constructing Fixed Offshore Structures in Ice Environments, American National Standards Institute/American Petroleum Institute, Washington, DC
3. Ryan, William L., and Crissman, Randy D., 1990. Cold Regions Hydrology and Hydraulics (Technical Council on Cold Regions Engineering Monograph, American Society of Civil Engineers, ISBN: 0-87262-773-X, 840 pp.
4. Eranti, E., and Lee, G., 2000. Cold Region Structural Engineering, McGraw-Hill
5. McFadden, T., and Bennett, F., 1991. Construction in Cold Regions – A Guide for Planners, Engineers, Contractors, and Managers, John Wiley & Sons, Inc., NY,

CE A683 Arctic Hydrology and Hydraulic Engineering (web-based)

COURSE CONTENT GUIDE
University of Alaska Anchorage, School of Engineering

Date initiated: 4 November 2002 **Date revised:**

Course title: Arctic Hydrology and Hydraulic Engineering **Course number**: CE A683

Credits: 3.0 **CEU's**: **Course duration**: 15-week semester

Contact hours: Information in the format of narrated PowerPoint presentations, short videos, and other online study aids are presented in weekly, each requiring an average two hours to review. Required online guided discussions and other interactions with the instructor and other students requires an additional one hour average weekly, for <u>3.0 hours per week</u> or 3 hours/week * 15 weeks = 45 hours total contact time.

Programs: Arctic and Civil Engineering **Grading basis**: A - F

Course Description: Aspects of hydrology and hydraulics unique to engineering problems of the North. Emphasis on Alaskan conditions, information from Canada and other circumpolar countries included.

Course registration restrictions: Graduate standing, with a degree in engineering or physical science, or upper class standing in an accredited undergraduate program in these categories.

Course prerequisites: CE A344 Water Resources Engineering or equivalent

Fee amount: $38 (or current UAA distance education fee)

I. Instructional Goals and Student Outcomes.

A. **Instructional Goals**: Instructive online presentations and materials will provide students with information about:
1. Hydrology and hydraulics fundamentals and related physical principles
2. Cold regions natural conditions and engineering challenges, with particular regard to lakes and streams of the north
3. Associated specialized language and units of measure
4. Location, interpretation, and application of public information about cold regions precipitation, stream flow, and related physical conditions
5. Specialized applications of fundamental principles to solve common cold regions hydraulic engineering problems, including
    a. Properties of freshwater ice

b. River ice growth and decay
c. River ice hydraulics
d. Ice jam prediction and mitigation measures
e. Numerical modeling of river flows and water levels with ice using HEC-RAS code
f. Snow properties and snowmelt hydrology

B. **Student Outcomes**: On successful completion of the course, students will have gained sufficient knowledge to:

1. Recognize natural conditions and engineering challenges that are unique to rivers and streams in cold regions,
2. Interpret associated specialized language and units of measure,
3. Locate, interpret, and apply public information about cold regions hydrology and related physical conditions,
4. Apply physical principles for specialized solutions to cold regions hydraulic engineering problems, including
    a. Prediction of river ice growth and decay,
    b. Analysis of river ice hydraulics,
    c. Prediction of ice jams and design of mitigation measures,
    d. Simulation of river flow and water level changes, including effects of ice, using HEC-RAS, and
    e. Prediction and analysis of snow properties and snowmelt effects on stream flow.

II. Guidelines for evaluation

A. **Homework assignments**: Students may also be required to perform computations and to interpret data and other information about cold regions stream flow, ice growth and decay, snow hydrology.

B. **Term Project and Report**: A realistic practical cold regions hydraulic engineering problem is assigned requiring students to assess the nature of the problem, retrieve appropriate data, perform analyses and simulations, and plan hydraulic engineering works or water works management decisions.

C. **Midterm and Final Exams**: A midterm and a comprehensive final exam will be administered online for which only one attempt at correct answers will be allowed. Students will be required to explicitly vouch for their academic honesty on the exam.

III. Course level justification

A. The primary context of the course will be discussion by the instructor and among professional peers on advanced technical topics, with the basic assumption that students are accustomed to this level of interaction.

B. Presentations and reading will include advanced scientific and engineering topics that require for complete interpretation a background in math and science equivalent to that of a bachelors degree program in civil engineering.

C. Significant responsibility for independent critical thinking, efficient learning habits, and interpretation of technical information will fall on the student, at a level commonly associated with graduate education.

IV. Topical course outline

A. Review units of measure, static fluid behavior, and basics of fluid flow

B. Review principles of dynamic fluid behavior and fundamentals of open channel flow

C. Review fundamentals of hydrology and river hydraulics

D. Ice formation in turbulent and quiescent water

E. Evolution of river ice

F. River ice jams overview

G. River ice hydraulics

H. Ice jam force balance

I. HEC-RAS with ice of known thickness and roughness

J. HEC-RAS with wide river ice jams

K. Project on estimating ice jam flood levels

L. Engineering aspects of river ice

M. Snow properties

N. Snowmelt hydrology

V. Suggested text and bibliography

A. Suggested text

Ryan, William L., and Crissman, Randy D., 1990. Cold Regions Hydrology and Hydraulics (Technical Council on Cold Regions Engineering Monograph, American Society of Civil Engineers, ISBN: 0-87262-773-X, 840 pp.

B. **Bibliography** (a variety of web references, including technical papers and reports by the US Army Cold Regions Research and Engineering Laboratory, will also be cited in course presentations)

1. USACE, 1999. "Ice Engineering," EM 1110-2-1612, US Army Corps of Engineers, Washington, DC

2. Giles, R., Evett, J., Liu, C., 1995. Fluid Mechanics and Hydraulics, Schaum's Theory and Problems, McGraw-Hill

3. IASC, The International Classification for Seasonal Snow on the Ground," International Commission on Snow and Ice of the International Association of Scientific Hydrology and the International Glaciological Society

4. White, Kathleen, Hydraulic and Physical Properties Affecting Ice Jams," ERDC/CRREL Report 99-11, US Army Cold Regions Research and Engineering Laboratory

5. Chin, David A., 2000. Water Resources Engineering, Prentice Hall

6. Mays, Larry W., 2001. Water Resources Engineering, John Wiley & Sons

7. Dingman, S. Lawrence, 2002. Physical Hydrology, 2nd ed., Prentice Hall

CE A684 Arctic Utility Distribution (web-based)

COURSE CONTENT GUIDE
University of Alaska Anchorage, School of Engineering

Date initiated: 4 November 2002 **Date revised:**

Course title: **Arctic Utility Distribution** **Course number**: CE A684

Credits: 3.0 **CEU's**: **Course duration**: 15 week semester

Contact hours: Information in the format of narrated PowerPoint presentations, short videos, and other online study aids are presented in weekly, each requiring an average two hours to review. Required online guided discussions and other interactions with the instructor and other students requires an additional one hour average weekly, for 3.0 hours per week or 3 hours/week * 15 weeks = 45 hours total contact time.

Programs: Arctic and Civil Engineering **Grading basis**: A - F

Course Description: The course reviews physical principles and current practices associated with planning and design of safe, efficient, and affordable water supply, fire protection, wastewater collection and disposal, and solid waste disposal works in cold regions, with a view toward conditions of rural Arctic Alaska.

Course registration restrictions: Graduate standing, with a degree in engineering or physical science, or upper class standing in an accredited undergraduate program in these categories.

Course prerequisites: CE A344 Water Resources Engineering or equivalent

Fee amount: $38 (or current UAA distance delivery fee)

I. Instructional Goals and Student Outcomes.

A. **Instructional Goals**: Instructors will present materials, lead discussions, and assign exercises intended to introduce the basic principles and current practices associated with planning and design of cold regions utilities systems, to prepare students for practice in this specialized field of engineering.

B. **Student Outcomes**: On successful completion of the course, students will have developed knowledge and skills to:

1. Acquire, integrate, and interpret data from public archives regarding site conditions associated with planning and design of community utility systems
2. Formulate field measurement programs to determine site conditions to sufficient detail for planning and design of cold regions utility systems
3. Formulate planning and design criteria appropriate for community health and safety needs, financial constraints, and long-term operation and maintenance capabilities
4. Plan and design cold regions community systems for:
   I. Water supply,
   J. Water treatment,
   K. Water storage,
   L. Water distribution,
   M. Wastewater collection,
   N. Wastewater treatment,
   O. Utilidors,
   P. Fire protection, and
   Q. Solid and hazardous waste management.
5. Incorporate means for efficient energy management in the above utilities systems

II. Guidelines for evaluation

A. **Homework assignments**: Students are required to perform computations and to interpret data and other information about lake, river, and sea ice properties, behavior, and related effects on offshore or waterfront structures. These submittals provide instructors means to assess the learning progress of students and to provide students with related guidance.

B. **Term Project and Report**: A realistic practical ice engineering problem is assigned requiring students to assess the nature of the problem, retrieve appropriate data, perform analyses and simulations, and plan offshore or waterfront engineering works in ice. These submittals provide instructors with means to appraise the extent of students' understanding of principles and skill in their application to solve practical problems in this specialized field of engineering.

C. Midterm and Final Exams: A midterm and a comprehensive final exam will be administered online for which only one attempt at correct answers will be allowed. Students will be required to explicitly vouch for their academic honesty on the exam. Scores on these exams will provide instructors with means to measure students' comparative command of principles and level of skill in their application at the midway point and at the conclusion of the course and to accordingly assign individual final recorded grades.

III. Course level justification

A. The primary context of the course will be discussion among professional peers on advanced technical topics, with the basic assumption that students are accustomed to this level of interaction.

B. Presentations and reading will include advanced scientific and engineering topics that require for complete interpretation a background in math and science equivalent to that of bachelor's degree programs in engineering.

C. Significant responsibility for independent critical thinking, efficient learning habits, and interpretation of technical information will fall on the student, at a level commonly associated with graduate education.

IV. Typical course outline

A. Planning Considerations
B. Geotechnical Considerations
C. Thermal Considerations
D. Water Source Development
E. Water Treatment
F. Water Storage
G. Water Distribution
H. Wastewater Collection
I. Wastewater Treatment
J. Utilidors
K. Fire Protection
L. Solid and Hazardous Waste Management
M. Energy Management

V. Suggested text and bibliography

A. Suggested text

Smith, D. W., 1996. Cold Regions Utilities Monograph, 3rd ed., American Society of Civil Engineers, New York, NY

B. Bibliography

1. McFadden, T., and Bennett, F., 1991. Construction in Cold Regions – A Guide for Planners, Engineers, Contractors, and Managers, John Wiley & Sons, Inc., NY,

2. Eranti, E., and Lee, G., 2000. Cold Region Structural Engineering, McGraw-Hill

ME A685 Arctic Heat & Mass Transfer (web-based)

COURSE CONTENT GUIDE (CCG)
University of Alaska Anchorage, School of Engineering

Date initiated: 4 November 2002 **Date revised:**

Course title: Arctic Heat & Mass Transfer **Course number**: ME A685

Credits: 3.0 **CEU's**: **Course duration**: Semester

Contact hours: Information in the format of narrated PowerPoint presentations, short videos, and other online study aids are presented in weekly, each requiring an average two hours to review. Required online guided discussions and other interactions with the instructor and other students requires an additional one hour average weekly, for 3.0 hours per week or 3 hours/week * 15 weeks = 45 hours total contact time.

Programs: Arctic and Civil Engineering **Grading basis**: A - F

Course Description: Application of the principles of heat and mass transfer with special emphasis on application to problems encountered in the Arctic such as ice and frost formation, permafrost, condensation, and heat loss in structures.

Course registration restrictions: Graduate standing, with a degree in engineering, geomatics, or physical science, or upper class standing in an accredited undergraduate program in these categories.

Course prerequisites: ES A346 (Thermodynamics) or equivalent

Fee amount: Regular scale for tuition and fees (self-supporting course)

I. Instructional Goals and Student Outcomes

A. Instructional Goals

Provide instructive online presentations and materials that do the following:

1. Review physical properties, mathematics including calculus, and analytical methods necessary for solving heat and mass transfer problems encountered in cold regions,
2. Identify and summarize governing processes associated with freezing and thawing phenomena in cold regions,
3. Utilize specialized language and units of measure for heat and mass transfer in cold climates,

4. Locate, interpret, and apply public information about cold regions physical conditions and engineering, and
5. Apply governing principles to solve common cold regions engineering problems,
6. Apply heat and mass transfer problem solving techniques to analyze roads, buildings, pipelines, and utilidors under cold climate conditions.

B. **Student Outcomes**

On successful completion of the course, students will have gained sufficient knowledge to do the following:

1. Determine and summarize the mathematical and physical properties governing heat and mass transfer in cold climates,
2. Interpret an apply associated specialized language and units of measure,
3. Gather specialized scientific and engineering public information about cold regions physical conditions,
4. Apply fundamental physical principles in solving common cold regions engineering problems,
5. Predict temperature variations in soils based upon climatic and physical soil data,
6. Determine temperature profiles in structure walls, roof, and foundations,
7. Predict moisture content and mass flow rates in structures, and
8. Determine soil freeze and thaw rates associated with buried pipelines and utilidors.

II. Guidelines for evaluation

A. **Practice exams**: Students will complete automatically graded practice exams for which multiple attempts will be allowed. In other words, they will have the opportunity to correct wrong answers from their initial attempt. Problems on the practice exams will be akin to conventional homework assignments and problems in the Final Exam.

B. **Homework assignments**: Students may also be required to perform computations and to interpret data and other information about cold regions in 10 to 15 electronic file “e-homework” submittals.

C. **Guided discussions**: A variety of opportunities will be provided for students to participate in guided discussions on cold regions engineering topics. Discussions will be primarily among students on topics provided by the instructor. Groups will be assigned hypothetical problems and will report their conclusions to the instructor. All discussions will be available for viewing by all enrolled students.

D. **Final exam**: A final exam will be administered online for which only one attempt at correct answers will be allowed. Students will be required to explicitly vouch for their academic honesty on the exam. The majority of the course score will be based on the score of this final exam.

III. Course level justification

A. The primary context of the course will be discussion among professional peers on advanced technical topics, with the basic assumption that students are accustomed to this level of interaction.

B. Presentations and reading will include advanced scientific and engineering topics that require for complete interpretation a background in math and science equivalent to that of bachelors degree programs in engineering, architecture, landscape architecture, geomatics, and physical science.

C. Significant responsibility for independent critical thinking, efficient learning habits, and interpretation of technical information will fall on the student, at a level commonly associated with graduate education.

IV. Topical course outline

A. Course introduction
   1. Web instruction procedures
   2. Contact information and communication methods
   3. Course content
   4. Course expectations

B. Information collecting
   1. Databases
   2. Web sources
   3. Federal and State agencies
   4. Other public sources

C. Regional temperature data
   1. Freezing Index
   2. Thawing Index
   3. Temperature Variation

D. Physical properties
    1. Thermal diffusivity
    2. Thermal conductivity
    3. Resistance
    4. Steam tables
    5. Psychometric charts
    6. Freezing point depression
    7. Heat of fusion
    8. Heat of vaporization
    9. Heat of sublimation

E. Zone refining
    1. Phase diagrams fundamentals
    2. Sodium chloride and water system
    3. Seawater phase diagram
    4. Distillation
    5. Extraction

F. Heat transfer fundamentals
    1. Flat surfaces
    2. Cylindrical surfaces
    3. Multi-layered systems
    4. Single phase systems
    5. Heat transfer with freezing and thawing systems

G. Temperature distribution in soils
    1. Whiplash curves
    2. Neumann equation
    3. Stephan solution
    4. Modified Berggren equation

H. Temperature measurement
    1. Thermocouples
    2. Thermistors
    3. Temperature measurement devices

I. Foundation design in cold regions
    1. Thermo-siphons
    2. Ventilated pads
    3. Mechanical cooling
    4. Shape factors

J. Structures
    1. Temperature distribution below heated structures
    2. Mass transport in structures
    3. Temperature distribution in structures
    4. Heat transport in structures

K. Buried pipelines, roads, and utilidors
    1. Thermal flow net construction
    2. Temperature profiles
    3. Heat and mass transport

V. Suggested Text and Bibliography

A. Suggested text

The suggested text for this course will be by Freitag, D. R., and McFadden, T., 1997. Introduction to Cold Regions Engineering, ASCE Press, NY. Additional supplemental material will be gathered if needed from public information sources such as the US Army Cold Regions Research and Engineering Laboratory (CRREL) publications web site (http://www.crrel.usace.army.mil/techpub/).

B. Bibliography

i. Andersland, O. B., and Ladanyi, B., 1994. Frozen Ground Engineering, Chapman & Hall, NY.
ii. Cengel, Y.A., and Boles, M.A., 1998, Thermodynamics, McGraw-Hill, NY.
iii. Eranti, E., and Lee, G., 2000. Cold Region Structural Engineering, McGraw-Hill, NY.
iv. Holman, J. P., Heat Transfer, 2002, McGraw-Hill, NY.
v. Incropera, F.P., and DeWitt, D.P., 1996, Heat and Mass Transfer, John-Wiley and Sons, NY.
vi. Lunardini, Virgil J., 1981, Heat Transfer in Cold Climates, Van Nostrand Reinhold, NY.
vii. McFadden, T., and Bennett, F., 1991. Construction in Cold Regions – A Guide for Planners, Engineers, Contractors, and Managers, John Wiley & Sons, Inc., NY.
1. Rice, Eb, 1996. "Building in the North," Alaska Science and Technology Foundation, Anchorage.
viii. Smith, D. W., ed., 1996. Cold Regions Utilities Monograph, 3rd ed., Technical Council on Cold Regions Engineering Monograph, American Society of Civil Engineers.

ME A687 Arctic Materials (web-based)

COURSE CONTENT GUIDE
University of Alaska Anchorage, School of Engineering

(in preparation, July 2003)

CE A688 Snow Engineering (web-based)

COURSE CONTENT GUIDE
University of Alaska Anchorage, School of Engineering

Date initiated: 4 November 2002 **Date revised:**

Course title: Snow Engineering **Course number**: CE A688

Credits: 3.0 **CEU's**: N/A **Course duration**: 15 week semester

Contact hours: Information in the format of narrated PowerPoint presentations, short videos, and other online study aids are presented in weekly, each requiring an average two hours to review. Required online guided discussions and other interactions with the instructor and other students requires an additional one hour average weekly, for 3.0 hours per week or 3 hours/week * 15 weeks = 45 hours total contact time.

Programs: Arctic and Civil Engineering **Grading basis**: A - F

Course Description: Factors are reviewed governing design of engineering works which must contend with the presence of snow or use snow as a structural material. Topics discussed include basic physical properties of snow, snow deposition and metamorphism, snow measurements, snow mechanical and thermal properties, snow-wind interactions, snow loads on buildings and other structures, snow control, and avalanches.

Course registration restrictions: Graduate standing, with a baccalaureate degree in engineering, or upper class standing in an accredited undergraduate program in engineering.

Course prerequisites: ES A331 Mechanics of Materials or equivalent

Fee amount: $38 (or current UAA distance delivery fee)

I. Instructional Goals and Student Outcomes.

A. **Instructional Goals**: Instructors will present materials, lead discussions, and assign exercises intended to give senior or graduate engineering students ability to analyze properties of snow, predict behavior of snow under natural conditions, predict snow forces on engineering structures, design snow roads and airstrips, and predict other snow effects, including avalanches, pertinent to safety and efficiency of human endeavors in cold regions.

B. **Student Outcomes**: On successful completion of the course, students will have developed knowledge and skills to:

1. Integrate and apply the key mechanical and thermal properties of snow to formulate plans for and execute relevant snow measurements and understand errors associated with these.
2. Apply either the continuum or granular model of snow as a structural material for planning and design of engineering works.
3. Predict various aspects snow deformation (like compaction)
4. Predict snow forces on structures as structural design criteria.
5. Design structures to control wind-drifting of snow consistent with local climatological conditions.
6. Predict insulation characteristics of accumulated snow and heat losses from structures covered with snow.

II. Guidelines for evaluation

A. **Homework assignments:** Students are required to perform computations and to interpret data and other information about snow properties, behavior, and related effects on structures.

B. **Term Project and Report**: Student complete a practical application of snow engineering principles that requires background research for snow properties, modeling, and estimation of likely uncertainties in model outcomes.

C. **Midterm and Final Exams**: A midterm and a comprehensive final exam will be administered online for which only one attempt at correct answers will be allowed. Students will be required to explicitly vouch for their academic honesty on the exam.

II. Course level justification

A. The primary context of the course will be discussion among professional peers on advanced technical topics, with the basic assumption that students are accustomed to this level of interaction.

B. Presentations and reading will include advanced scientific and engineering topics that require for complete interpretation a background in math and science equivalent to that of bachelor's degree programs in engineering.

C. Significant responsibility for independent critical thinking, efficient learning habits, and interpretation of technical information will fall on the student, at a level commonly associated with graduate education.

III. Topical course outline

A. Snow Deposition and Metamorphism
   1. The water substance; important principles and facts
   2. Snow flakes, snowfall, and weather
   3. Snow on the ground
   4. Layered nature of snow covers
   5. Fundamental properties of snow covers
   6. Metamorphic processes affecting snow on the ground or structures
   7. Equilibrium growth
   8. Kinetic growth
   9. Wet snow

B. Snow Measurements
   1. Standard methods of characterizing snow
   2. Tools and instruments
   3. Data widely available from agencies
   4. Remote sensing of snow

C. Snow Mechanical Properties
   1. A continuum or macroscopic view of snow
   2. A granular or microscopic view of snow
   3. Snow mechanical properties
   4. Snow deformation
   5. Sintering
   6. Continuum and discreet mechanical models of snow

D. Snow Thermal Properties
   1. Mechanisms of heat transfer (conduction, convection, vapor transport)
   2. Continuum models of snow as an insulator
   3. Common computations for snow related to temperature and heat flow

E. Snow and Wind
   1. Processes at work during wind transport of snow
   2. Saltation, suspension, sublimation
   3. Drifting and scouring: general principles
   4. The wind-blown flux of snow
   5. Snow loads on buildings and other structures
   6. Snow fences and other control structures

F. Snow Hydrology
   1. The role of snow hydrology for human activity
   2. Snow cover development, metamorphosis, and ablation
   3. Measurement methods for determining snow water equivalent

4. Snow melt and water flow through snow
5.Controlling factors that influence snowmelt runoff
6. Information sources for engineering data

G. Avalanches
1. Snow conditions related to avalanches
2. Avalanche dynamics
3. Avalanche prevention and control

H. Snow Engineering Case Histories
1. Snow forces on structures
2. Protecting roads and pads with snow fences
3. Depth of winter freeze and snow cover
4. Snow roads and airstrips
5. Trafficability and over-snow travel

IV. Suggested text and bibliography

A. Suggested text

No suggested text. References will be drawn from the professional literature.

B. Bibliography

1. Ryan, William L., and Crissman, Randy D., 1990. Cold Regions Hydrology and Hydraulics (Technical Council on Cold Regions Engineering Monograph, American Society of Civil Engineers, ISBN: 0-87262-773-X, 840 pp.
2. Eranti, E., and Lee, G., 2000. Cold Region Structural Engineering, McGraw-Hill
3. McFadden, T., and Bennett, F., 1991. Construction in Cold Regions – A Guide for Planners, Engineers, Contractors, and Managers, John Wiley & Sons, Inc., NY,
4. Gray, D. M. and Male, D. H., 1981. Handbook of Snow: Principles, Processes, Management & Use, Pergamon Press, ISBN 0-08-025374-1, 776 pp.
5. Annals of Glaciology (selected readings) International Glaciological Society.
6. Journal of Glaciology (selected readings) International Glaciological Society.
7. The Role of Snow and Ice in Hydrology (Proceedings of the Banff Symposia, September 1972), Unesco-WMO-IAHS, 827 pp.

8. Mellor, M., 1975. A review of basic snow mechanics, International Symposium on Snow Mechanics. Union Géodésique et Géophysique Internationale. Association Internationale des Sciences Hydrologiques. Commission des Neiges et Glaces, Grindelwald, Switzerland, April 1974, pp. 251-291.
9. Mellor, M., 1977. Engineering properties of snow. Journal of Glaciology, 19(81): 15-66.
10. Shapiro, L.H., Johnson, J.B., Sturm, M. and Blaidsell, G.L., 1997. Snow Mechanics: Review of the state of knowledge and applications. 97-3, US Army Cold Regions Research and Engineering Laboratory.
11. Hjorth-Hansen, E. Holand, I. Løset, S., Norem H. (eds), 2000, Snow Engineering: Recent Advances and Development, Proceedings of the fourth conference on snow engineering, Trondheim, Norway, 19-21 June 2000, AA. Balkema, Rotterdam, 456 pp.

APPENDIX B

ARCTIC ENGINEERING

PROJECT REPORT GUIDELINES

Arctic Engineering Project Report Guidelines

Format and Library Submission Requirements

These guidelines are adapted from and compatible with those issued for Masters Theses by the UAA Library Dean's Office. Guidance below regarding a "thesis" also applies to Arctic Engineering project reports. Except as specified below, Arctic Engineering project reports should follow the guidelines for journal publications of the American Society of Civil Engineers, which can be reviewed at http://www.pubs.asce.org/authors/index.html. Winnie Treitline is the UAA Library staff contact for thesis format and library submission and can be reached anwct@uaa.alaska.edu or by telephone at 907-786-1825.

UAA may reject a thesis that is not properly formatted. Students are encouraged to have Ms. Treitline check sample pages of your thesis prior to its submission deadline to avoid last minute delays or revisions. Please contact her in advance to set up an appointment for this review. Be aware that previously published theses are not suitable for use as format guides because the requirements may have changed.

UAA requires you to submit one original or high-quality copy of your thesis to the Library Dean's Office. This office then makes a copy on archival bond paper, binds the original and the archival copy, and deposits both in the library. The library pays the copy and binding costs.

UAA also requires every thesis to be microfilmed through University Microfilms Inc. (UMI), an international archiving and distribution service. You will need to pay the microfilming cost and fill out and sign a Master's Thesis Agreement Form. The form is contained in UMI's brochure, *Publishing Your Master's Thesis: How to Prepare Your Manuscript for Publication*, which is available in the Library Dean's Office. The library will send your thesis to UMI for filming and, if you are interested, it can also apply through UMI for copyright on your behalf. Note that UAA format requirements take precedence over those of UMI.

Paper. Paper must be good quality, 20-pound, white typing paper and measure 8-1/2 inches by 11 inches. Easy-erase types of paper will not be accepted.

Printing. Theses should be typewritten or printed on one side of the paper only. The print should be an even shade throughout the document, and lines must be double-spaced. Computers, word processors, or typewriters may be used, as may any simple, non-script typeface in either 10-pitch or 12-pitch. Any departure from a simple, non-script typeface will not be accepted unless its use is functional to the project and has received my prior approval. Laser printers are recommended.

Margins. Your thesis will be bound on the left margin. Both it and the top margin must measure 1-1/2 inches. The right and bottom margins must measure 1 inch. The entire text, including page numbers, figures, tables, other illustrative matter, and appendices, should conform to these margin specifications. The library has all theses bound, so it is imperative margins be exact. All page numbers, text, diagrams, figures, forms, photocopied letters - everything - in the main document, as well as references and appendices must fit into these margins:

<table>
<tr><td colspan="3">Top: 1 1/2 inches</td></tr>
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1 1/2 inches</td><td></td><td>Right:
1 inch</td></tr>
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</table>

Only 2-1/2 inches or less can be bound into one volume. If your thesis is extremely thick due to length or thickness of paper, please contact Ms. Treitline for special instructions on formatting for two volumes.

Illustrative Matter. Follow the specifications for producing and mounting illustrative matter in the style manual recommended by your program or thesis committee. Be sure that all illustrative matter complies with the minimum margin specifications given above. If photographs and/or maps are used, submit two sets of original prints or color photocopies.

Title Page and Signature Page. This guideline contains samples showing how title and signature pages should be formatted. These formats have been approved by UAA's Vice Chancellor for Academic Affairs and the Academic Affairs Board.

Abstract. Each thesis must include an abstract that gives a succinct account of the work and does not exceed 150 words. The abstract should be double-spaced and typed on one side of the paper only. It should contain:

1. statement of the problem,
2. procedure or methods,
3. results, and
4. conclusions.

The abstract will appear as you have written it in UMI's quarterly publication, *Masters Abstracts International*. This bibliographic information will also be made available to various computer searching systems. It should contain:

Arrangement and Pagination of Contents. The contents of your thesis should be arranged in the sequence listed below. Number pages sequentially as indicated, and conform to margin specifications. All pages (except those noted below) should be numbered so that they do not become disordered during copying or microfilming. If you are writing your thesis with the prospect of having it formally published and need to lay it out differently, please contact Ms. Treitline.

A. Title Page: unnumbered
B. Signature Page: unnumbered
C. Dedication Page (optional): unnumbered
D. Acknowledgments (optional): page i
E. Abstract: page ii (or page i if no acknowledgments page)
F. Contents or Table of Contents: page iii
G. List of Illustrations (if applicable): page iv
H. List of Tables and or List of Figures (if applicable): page v
I. Preface (if applicable): page vi
J. Body of Thesis (text): begin with unnumbered page 1 (number all following pages using Arabic numerals)

1. Introduction: This section is should provide the reader with understanding of the purpose of the project, and should include a statement of the central problem or hypothesis of the analysis presented in the report. The statement must contain sufficient background information to enable a reader to grasp the importance of the work. After reading the Introduction, the reader should know what is to follow in later sections and how the argument will unfold. The entire report should be written in third-person-singular professional language and not in a conversational style.

2. Literature Review: This section will establish how the report fits into the existing body of knowledge on the topic. It should explain how, based on findings cited from published literature, the work presented will contribute to knowledge of the topic. This should be achieved with a narrative discussion of all relevant prior work leading to a logical statement justifying the value of the project in light of the literature reviewed. After reading the Literature Review section, the reader should understand how the report contributes to knowledge in the field and how existing literature supports the premise.

3. Methods and Materials: This section should provide the reader with an understanding of how the project was carried out. Enough detail must be presented so that someone reading the work has complete information to repeat the work in an attempt to reproduce the results. It should specify sources of instruments, equipment, and materials with model numbers and provide a step-by-step description of procedures applied or references to such

description. The Methods and Materials section should leave the reader with an unambiguous understanding of how results were achieved.

4. Results: This section must present the results of any experimental work, original thought and development, and must discuss them in light of the background developed in preceding sections of the project report, especially as it relates to the problem statement and how results align with other relevant research and development. At the end of the Results section, the reader should have a clear idea of what new information has been provided and what this information means as a contribution to the field.

5. Conclusions: This section should list conclusions, each with a short amplifying statement. Amplifying statements should explain how each conclusion aligns with previous knowledge concerning the topic.

6. Recommendations: This section should list recommendations for future work on the same subject or problem, each with a short amplifying statement. Recommendations may propose specific research and development or changes in professional practice or public policy. Amplifying statements should indicate how the recommendations could be carried out.

7. References: This section should contain the full reference to all sources of information cited in the report. Literature not cited in the report should not appear in the References section.

8. Bibliography (optional): This section should list sources of information not cited in the text of the report, but which have significant reference value on the topic. The format of this section should be identical to that for the References section. References that have been cited in the body of the report should not appear in the Bibliography section.

K. Appendix or Appendices (if applicable): follow the sequential page numbering of the text

Copyright. If you wish to copyright your thesis, the library will apply through UMI for copyright. Fill out and give me the copyright application section of UMI's Masters Thesis Agreement Form. If you are requesting copyright, place a copyright notice on the title page of your thesis or on the following leaf. It should appear as:

©1996 by John Smith
or
Copyright 1996 by John Smith.

Microfilming Agreement. Your thesis must be accompanied by a completed and signed Masters Thesis Agreement Form from UMI. UMI will not accept altered agreements, so do not alter the agreement.

Number of Copies. The library requires one original or high-quality copy of your thesis. It must have all the necessary signatures and meet format specifications. Please call Ms. Treitline for an appointment when you are ready to submit your thesis for library approval. The Library Dean's Office can provide information on how to obtain microfilm copies from University Microfilms or bound, personal copies of the manuscript from a recommended book bindery. If you want bound copies, the bindery will need a perfect copy of the unbound manuscript.

Costs. The cost for microfilming your thesis is $45.00. There is an optional $45.00 charge for copyright registration. Fees may be paid by cash, check (made payable to the University of Alaska Anchorage), or by credit card (Visa®, MasterCard®, Discover®). When you have paid your fees, the library will give you a "Thesis Binding Receipt." You will need to give this receipt to UAA Enrollment Services to show that you have submitted your thesis.

Submission Deadline. The library does not set a deadline for receiving theses. Check early with your thesis chairperson and with UAA Enrollment Services (786-1480) for their deadline requirements.

Checklist for Graduate Students

- Have you registered with Enrollment Services to graduate in the semester in which you are submitting your thesis?
- Have you checked with Enrollment Services to verify that all required steps have been met for graduation?
- If applicable, have you had your deferred grade changed? You need a grade change, not a new grade submitted.
- If applicable, do you have permission letters for previously copyrighted materials? A copy of those letters must accompany your thesis.
- Does your thesis abstract adhere to the maximum word length of 150 words? (UMI reserves the right to edit inordinately long abstracts).
- Are all charts, graphs, and other special illustrative materials legible?
- Are all the pages in your thesis numbered consecutively?
- Do all the pages in your thesis conform to the margin requirements? Do your page numbers, headers, charts, graphs, and appendices conform?
- If you have colored charts, graphs, or photographs, have you made an extra set of originals or color photographs to submit with your thesis?
- Do you have all the approval signatures from your committee and the Dean/Director of your school or college?
- Have you made an appointment to have your thesis submitted to the library?

Sample Title Page (without copyright notice)

THE EFFECTS OF GLOBAL WARMING

ON THE COST OF ROAD CONSTRUCTION IN ALASKA

by

John Q. Smith

ARCTIC ENGINEERING PROJECT REPORT

Presented to the Faculty of the

School of Engineering

University of Alaska Anchorage

In Partial Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE IN ARCTIC ENGINEERING

May 1996

Sample Title Page (with copyright notice)

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Sample Signature Page (each committee member must sign)

May 1996

THE EFFECTS OF GLOBAL WARMING

ON THE COST OF ROAD CONSTRUCTION IN ALASKA

by

John Q. Smith

ARCTIC ENGINEERING PROJECT REPORT

APPROVED: Graduate Studies Committee

______________________________ __________
[Typed Name], Chairperson Date

____
[Typed Name], Committee Member

____
[Typed Name], Committee Member

ACCEPTED:

______________________________ __________
[Typed Name], Dean, School of Engineering Date

APPENDIX C

Useful Forms

UNIVERSITY of ALASKA ANCHORAGE
School of Engineering
Graduate Student Application for Admission to Candidacy[2]

Student Name: ______________, __________________ (Last) (First) (MI) Day Phone: __________

Social Security Number: _______________ Email address: ____________________

Degree sought: Master of Engineering ☐ Master of Science ☐

Major: ____________________________ Emphasis: ___________________

Date of admission to graduate program: ________ Catalog Year: ________________

Expected graduation date: ________ UAA Graduate Level GPA: ______

Previous degree	Year	Institution	Major field of study

A. GRADUATE PROGRAM OF STUDY

Course No.	Title	Semester	Credits	Grade
		Total Credits		

Proposed Thesis or Project Report Title: ____________________________________

____

Thesis Research or Project Proposal attached? ☐

Student Signature: _____________________________ Date: _________________

[2] All terms of conditional admission to the program and all prerequisites must be satisfied. All academic deficiencies must be removed prior to Admission to Candidacy.

Graduate Program Advisory Committee[3] – Admission to Candidacy Approved

Name	Title	Institution	Signature[4]	Date
Committee Chair				
a) Committee Member				
Committee Member				
Committee Member				
Department/Program Chair				
Dean, UAA School of Engineering				

Graduate Committee - Approval for Oral Presentation[5]

Name	Signature[3]	Date
Committee Chair		
Committee Member		
Committee Member		
Committee Member		
Department/Program Chair		
Dean, UAA School of Engineering		

[3] Minimum 3 members; Chair and one other member must be UAA full-time faculty.
[4] Signatures from all Committee members are required.
[5] Final approval of the thesis or project report involves the Committee's and additional signatures, including the Dean's, on the cover page of the document, according to the "UAA Thesis Guideline."

UNIVERSITY of ALASKA ANCHORAGE

Office of Enrollment Services
3801 Old Seward Highway, Anchorage, AK 99503
P.O. Box 141629, Anchorage, AK 99514-1629
(907) 786-1480

APPLICATION FOR GRADUATION

Submit a **$20.00 application fee** with this form before the deadline published in the semester class schedule.

Print your name EXACTLY as you want it to appear on your diploma.

____
First **Middle** **Last**

____
Social Security Number

Expected Date of Graduation:
MAY ☐ AUG ☐ DEC ☐ Year________

Address: ______________________________
City: ______________________________
State: __________ Zip: ______________
Day Phone: ______________________________
If address is different, should we update to reflect this address?
Yes ☐ **No** ☐

Degree/Certificate: ______________________________
Major: ______________________________
Minor*: ______________________________
(if applicable, see note below)
Catalog Year: ______________________________
Emphasis: ______________________________
(if applicable)
Option: ______________________________
(if applicable)

Unless you specify not to, your name and degree or certificate will appear in the Commencement Program and will be released to the media.
Do NOT print or release my name: ☐

____
Student's Signature

____
Date

____
Advisor's Signature

____
Date

Students are responsible for meeting all General University Requirements, General Education Requirements, School/College Requirements, and Major requirements as printed in the University Catalog.

*Students graduating with a minor, who have not already done so, must declare their minor on this form. A minor will only be awarded along WITH a baccalaureate degree. Students must meet the minor requirements from the same catalog used for the baccalaureate degree. Only required minors are printed on diplomas.

Students who complete the requirements and meet the Application for Graduation deadline during the academic year (Fall & Spring Semesters) are invited to participate in the annual commencement ceremony in May. Students who complete the requirements and meet the Application for Graduation deadline during the Summer Semester are invited to participate in the commencement ceremony the following May.

Please note: Diplomas are ordered with the student's name exactly as it appears on this form. Diplomas reflecting a subsequent name change will not be automatically reordered. After submitting a Change of Name form, it is the student's responsibility to request, in writing, an updated diploma and pay the **$25 reorder fee**.

Students who apply for graduation and do not complete their degree requirements at the end of the semester must REAPPLY for graduation and pay a **$20.00 fee**. Application for Graduation deadline is published in the semester class schedule.

University of Alaska Anchorage

School of Engineering

Graduate Student Application for Admission to Candidacy[1]

Student Name: _______________, ___________________ Day Phone: ___________
(Last) (First) (MI)

Social Security Number: ________________ Email address: _____________________

Degree sought: Master of Engineering ☐ Master of Science ☐

Major: ______________________________ Emphasis: ____________________

Date of admission to graduate program: ________ Catalog Year: _________________

Expected graduation date: ________ UAA Graduate Level GPA: ______

Previous degree	Year	Institution	Major field of study

Graduate Program of Study

Course No.	Title	Semester	Credits	Grade
		Total Credits		

Proposed Thesis or Project Report Title: ______________________________________

____

Thesis Research or Project Proposal attached? ☐

Student Signature: ______________________________ Date: __________________

[1] All terms of conditional admission to the program and all prerequisites must be satisfied. All academic deficiencies must be removed prior to Admission to Candidacy.

(see reverse side)

Graduate Program Advisory Committee[2] – Admission to Candidacy Approved

Name	Title	Institution	Signature[3]	Date
Committee Chair				
Committee Member				
Committee Member				
Committee Member				
Department/Program Chair				
Dean, UAA School of Engineering				

Graduate Committee - Approval for Oral Presentation[4]

Name	Signature[3]	Date
Committee Chair		
Committee Member		
Committee Member		
Committee Member		
Department/Program Chair		
Dean, UAA School of Engineering		

[2] Minimum 3 members; Chair and one other member must be UAA full-time faculty.
[3] Signatures from all Committee members are required.
[4] Final approval of the thesis or project report involves the Committee's and additional signatures, including the Dean's, on the cover page of the document, according to the "UAA Thesis Guideline."

(see reverse side)

UNIVERSITY OF ALASKA ANCHORAGE

GRADUATE APPLICATION FOR ADMISSION

Please:
1. Type or print legibly in ink.
2. Complete both sides.
3. Sign and date the application.
4. Enclose the non-refundable $45.00 application fee.
5. Mail to Enrollment Services at the address provided.

Send application to: ENROLLMENT SERVICES
3211 Providence Drive
Anchorage, Alaska 99508-8046
(907) 786-1480
www.uaa.alaska.edu

PERSONAL

Full Legal Name ________ (Last) ________ (First) ________ (M.I.) Social Security Number ____-____-____

Previous Names ________________ Sex ☐ Male ☐ Female

Current Mailing Address ________ (Street) ________ (City) ________ (State) ________ (Zip)

E-Mail Address (optional) ________________ Date of Birth ____ (Month) / ____ (Day) / ____ (Year)

Local Phone Number ________________ Permanent Phone Number ________________

Permanent Mailing Address (If different from current) ________ (Street) ________ (City) ________ (State) ________ (Zip)

ETHNIC ORIGIN: Requested for compliance with Title IV of the Civil Rights Act of 1964. Optional. Used for statistical purposes only. *Check one.*

☐American Indian (IN)	☐White, non-Hispanic (WH)	☐Alaskan Eskimo, Other (AE)	☐Alaskan Indian, Tlingit (AK)
☐Black, non-Hispanic (BL)	☐Alaskan Aleut (AA)	☐Alaskan Indian, Southeast (AS)	☐Alaskan Indian, Haida (AH)
☐Hispanic (HI)	☐Alaskan Eskimo, Inupiat (AQ)	☐Alaskan Indian, Athabascan (AT)	☐Alaskan Indian, Other (AI)
☐Asian, Pacific Islander (PI)	☐Alaskan Eskimo, Yupik(AY)	☐Alaskan Indian, Tsimshian (AM)	☐Alaskan Native. Other (AN)
			☐Other (OT)

RESIDENCY

In what state do you claim official residency? ________________ Are you ☐ Active Duty Military ☐ Military Dependent

If you claim Alaska residency, how long have you lived in Alaska? ____ (Years) ____ (Months) Branch or Service ________________

CITIZENSHIP

Are you a U.S. citizen? ☐ Yes ☐ No
If no, list country of citizenship ________________ Visa type ________
If permanent resident, list card # ____________ Country of birth ________
Do you require an F-1 student Visa? ☐Yes ☐No TOEFL taken ☐Yes ☐No
You must provide a photocopy of your resident alien card.

TERM

Please check the term for which you are applying:
Please Choose One ☐ Fall 20____ Aug. 1 Deadline
☐ Spring 20____ Dec. 1 Deadline
☐ Summer 20____

Financial Aid Recipients: *You must be admitted for the term in which you receive aid.*

GRADUATE DEGREES AND CERTIFICATION PROGRAMS OFFERED AT UAA

(Please check one)

MASTER OF ARTS
- ☐ Anthropology
- ☐ English
- ☐ Interdisciplinary Studies

MASTER OF FINE ARTS
- ☐ Creative Writing and Literary Arts

MASTER OF BUSINESS ADMINISTRATION
- ☐ General Management

☐ **MASTER OF CIVIL ENGINEERING**

☐ **MASTER OF PUBLIC ADMINISTRATION**

☐ **MASTER OF SOCIAL WORK**

Many graduate programs require the Graduate Record Exam (GRE), the Graduate Management Admission Test (GMAT), or other achievement or aptitude tests. Some graduate programs have additional admission requirements.

MASTER OF SCIENCE
- ☐ Arctic Engineering
- ☐ Biological Sciences
- ☐ Civil Engineering
- ☐ Clinical Psychology
- ☐ Engineering Management
- ☐ Environmental Quality Engineering
- ☐ Environmental Quality Science
- ☐ Global Supply Chain Management
- ☐ Interdisciplinary Studies
- ☐ Nursing Science
- ☐ Science Management
- ☐ Vocational Education

MASTER OF EDUCATION

Master Teacher
- ☐ Curriculum and Instruction
- ☐ Early Childhood
- ☐ Educ Tech with Endorsement
- ☐ Educ Tech w/o Endorsement

Counseling and Guidance
- ☐ Adult Counseling
- ☐ Counseling (K-8)
- ☐ Counseling (7-12)
- ☐ Counseling (K-8, 7-12)
- ☐ Counseling & Guidance Spec Svcs
- ☐ General Counseling
- ☐ Vocational Ed Counseling

Educational Leadership
- ☐ Principal (K-8)
- ☐ Principal (7-12)
- ☐ Principal (K-8, 7-12)

Special Education
- ☐ Early Childhood Special Ed
- ☐ General Special Education

Adult Education
- ☐ Counseling & Guidance
- ☐ Curriculum and Instruction
- ☐ Distance Learning & Tech
- ☐ Human Resource Dvp & Ldrshp

ALASKA STATE TEACHER CERTIFICATION/ENDORSEMENT
- ☐ Counseling & Guidance (K-8)
- ☐ Counseling & Guidance (7-12)
- ☐ Counseling & Guidance (K-8, 7-12)
- ☐ Counseling & Guidance Spec Svcs
- ☐ Elementary Education (K-6)
- ☐ Secondary Education (7-12)
- ☐ Principal (K-8)
- ☐ Principal (7-12)
- ☐ Principal (K-8, 7-12)
- ☐ Superintendent
- ☐ Educational Technology

17723, 5/2002

EDUCATIONAL BACKGROUND

LIST HIGH SCHOOL ATTENDED

HIGH SCHOOL or GED	CITY/STATE	DATES ATTENDED MO/YR	GRADUATION DATE

LIST BELOW ALL UNIVERSITIES AND COLLEGES REFLECTING COMPLETION AND CONFERRAL OF ALL BACCALAUREATE DEGREES AND ANY POST GRADUATE LEVEL COURSES AND DEGREES: (INCLUDING UAA, UAF, and UAS)
Previously earned credits may be transferred toward UAA degrees or programs only from those regionally accredited schools listed below at the time of application for admission. You must submit an official transcript from each school below (except UAA, UAF, and UAS) to the office of Enrollment Services. Individual graduate programs may require additional transcripts.

UNIVERSITY or COLLEGE	CITY/STATE	DATES ATTENDED MO/YR	DEGREES EARNED & GRADUATION DATES

Test scores are required by certain schools and programs. Indicate dates you have taken or plan to take exam(s).

GRE Date Taken__________ Anticipated Date of Examination__________

GMAT Date Taken__________ Anticipated Date of Examination__________

Miller Date Taken__________ Anticipated Date of Examination__________

ADDITIONAL INFORMATION

The highest level of college education attained by either parent ☐ Associates ☐ Bachelor ☐ Masters ☐ Doctorate

EMERGENCY CONTACT

Contact Name (Person to notify in case of emergency)__________ Relationship__________

Mailing Address__________
(City) (State) (Zip)

Phone Number__________

AGREEMENT

ALL APPLICANTS PLEASE READ AND SIGN THE FOLLOWING

I understand that withholding information requested on this application or giving false information may make me ineligible for admission to the University or subject to dismissal. With this in mind, I certify that the above statements are correct and complete and if admitted, I agree to abide by the published policies, rules and regulations of the University of Alaska Anchorage. I further understand that from the time I file my application with the University, it is my responsibility to know all the rules, requirements and exemptions from my intended degree program.

__________ __________
(Signature) (Date)

In order to be reviewed, this application must be signed, dated and accompanied by a non-refundable application fee ($45).

AFFIRMATIVE ACTION

The University of Alaska Anchorage provides equal opportunity regardless of race, creed, color, national origin, religion, sex, age, citizenship, pregnancy, childbirth or related medical conditions, disability, or status as a Vietnam era or disabled veteran. Inquiries concerning the application of these regulations to the University may be directed to the University Office of Campus Diversity and Compliance, the Office of Civil Rights, or to the Office of Federal Contract Compliance Programs.

PAY BY CREDIT CARD

I authorize UAA to charge ☐ VISA ☐ MasterCard ☐ Discover

Card Number__________ Expiration Date__________ Signature__________

WOLFLINE REGISTRATION ACCESS FORM

UNIVERSITY OF ALASKA ANCHORAGE

Submission of this completed form allows activation for WolfLine registration access.
Application for admission is a separate process.

submit to
ENROLLMENT SERVICES
Administration Building Lobby
3211 Providence Drive
Anchorage Alaska 99508
Info: 786-1480 Fax: 786-1097

OFFICE USE

Entered_____________

Initials______________

Spring **Summer** **Fall** **2001**

Semester (circle one) Year

-- --

SOCIAL SECURITY NUMBER

Full Legal Name

LAST FIRST M.I.

/ / ☐ Resident ☐ Active Military ☐ Non-Resident

BIRTHDATE RESIDENCY: For tuition purposes, an Alaskan resident is anyone who has been physically present in Alaska for at least one year.

MAILING ADDRESS

CITY STATE ZIP CODE

(907) (907)

HOME PHONE DAYTIME PHONE

E-MAIL ADDRESS:

Gender: ☐ Male ☐ Female

Previous or Maiden Name:

Citizenship: ☐ U.S. ☐ Other

If other, please list: _________________

Foreign Students Visa Type?

- ☐ F1
- ☐ Permanent Resident
- ☐ Immigrant
- ☐ Other

Where were you living when you decided to attend UAA?

City: ________________________ State: ____________

High School: ☐ Diploma ☐ Foreign Equivalent ☐ GED ☐ Did not graduate

High School / GED Graduation Date_________________

Name of High School or GED test center: ________________________________

City: ________________________ State: ____________

Signature: ______________________________**Date:** ____________________

Ethnic Code

Ethnic origin is requested for compliance with Title IV of the Civil Rights Act of 1964. Used for statistical purposes only.

- ☐ Alaskan Aleut
- ☐ Alaskan Eskimo, Inupiat
- ☐ Alaskan Eskimo, Other
- ☐ Alaskan Eskimo, Yupik
- ☐ Alaskan Indian, Athabascan
- ☐ Alaskan Indian, Other
- ☐ Alaskan Indian, Southeast
- ☐ Alaskan Native, Other
- ☐ American Indian
- ☐ Asian, Pacific Islander
- ☐ Black, Non-Hispanic
- ☐ Hispanic
- ☐ White, Non-Hispanic
- ☐ Other

Veteran/Military Codes

- ☐ Active Duty--Airforce
- ☐ Active Duty--Army
- ☐ Active Duty--Coast Guard
- ☐ Active Duty--Navy / Marine
- ☐ Active Duty--Other
- ☐ Dependent Child
- ☐ Dependent Spouse
- ☐ Vet Not Receiving VA benefits
- ☐ Vet Receiving VA Benefits

What is your goal at UAA?

- ☐ 2 year degree
- ☐ 4 year degree
- ☐ Certificate
- ☐ Graduate Program
- ☐ High School Completion
- ☐ Job Change / Improvement
- ☐ Maintain License / Certification
- ☐ Transfer to another University
- ☐ Personal Development
- ☐ Other