

GEOGRAPHY 451: SNOW AND ICE IN OUR ENVIRONMENT

DR. LEE DEXTER - DEPARTMENT OF GEOGRAPHY - SPRING, 2003

Time/day: 9:10-10:00 MWF

Classroom: Bldg 82, F&G room 135

E-mail: lee.dexter@nau.edu

Web: <http://www.geog.nau.edu/~lrd>

Office: F&G 205

Phone: 523-6535

Office hours: 10:00-11:00 and 1:30-3:00 M & W or by appointment

COURSE PREREQUISITES AND RELATED COURSES:

No formal prerequisites, only an interest in the topic and a willingness to learn across a wide variety of disciplines (from physics to engineering, from geology to anthropology).

Classes which would provide an introduction to certain aspects of the material presented in this course would be; 1) physical geography, 2) environmental science courses, 3) weather and climate courses 4) hydrology and water resource classes, 5) earth science or geology courses.

Any of these related courses would be helpful but certainly not necessary. *Some field work may be physically strenuous*, however participation in these activities will be optional and other exercises can be substituted if necessary (contact me if this is a problem).

COURSE DESCRIPTION :

Of all the environmental factors which shape the physical world in which we live, the snow and ice (cryosphere) component is probably the least understood and appreciated by the layman and the scientist alike. At the same time, our existence is tremendously impacted in both positive and negative ways by these factors.

We will explore this fascinating component of our environment using a multi-faceted approach. As a sample of the diversity in this class; participants will investigate the physics of clouds and snow in the lab, will listen to experts discuss the impact of snow on water resources, will dig snow pits in the field to examine snow stratigraphy, will ski (or learn to ski) on Alpine and Nordic skis, will examine how highway safety is affected by snow and ice, will be able to dig snow shelters and optionally spend a night in those shelters, will study glaciers and glacial landforms then visit field examples of these landforms. etc. etc.

COURSE OBJECTIVES:

- To gain an appreciation for the cryosphere and its complexities.
- To prepare those who can use this material in a professional application.
- To investigate some basic snow and ice processes via lab exercises.
- To understand how this portion of our environment impacts humans, other organisms and indeed whole ecosystems.
- To have each participant research some small aspect of the cryosphere which is of interest to them. (continued)
- To gain self-confidence in taking care of ones self in these environments.

TEXT AND MATERIALS:

At this time there is no single text book which treats the subject in its entirety. Some topical books are good but out of print. We will use a selection of relatively inexpensive books:

1) *Snow and Ice in our Environment Course Resource Supplement*, L. R. Dexter ed. (2003) Scholargy Publishing (about \$30). Required.

2) *Snow and Ice in our Environment Exercise Manual*, L. R. Dexter ed. (2003) Scholargy Publishing (about \$15). Required.

3) *Avalanche Handbook* (1993) Dave McClung and Peter Schearer, The Seattle Mountaineers, Seattle Washington. This is an update of the classic 1976 U.S.F.S. handbook (about \$20). Required.

4) *Life in the Cold*(1996) by Peter Marchand, University Press of New England, Hanover, New Hampshire (about \$20). Required.

5) *Living Ice*(1988) by Robert Sharp, Originally published by Oxford University Press. Reproduction by Scholargy Publishing (about \$20). Required.

Outdoor equipment: each participant must outfit themselves with proper clothing for a full days outing in cold and wet conditions. Usually most items can be found in your closet already but you may need to obtain certain specialized pieces of equipment. A detailed list is attached and we will discuss this list for clarification.

Additional Fees: We will take a six-day/five-night field trip to Silverton, Colorado in late February. The transportation costs will come out of your class fee. During this field trip we stay in various B&Bs and hostels and are provided breakfast and dinner. We anticipate the cost for these services to run about \$250 per person. Each person will need to provide lunch items any other incidental expenses.

COURSE REQUIREMENTS:

- Assigned readings (text and outside).
- Attendance of lectures and field exercises (note some Saturdays may be used).
- Completion of approximately 7 exercises/field projects.
- Two written examinations and one short quiz.
- One 5 page written paper.
- One brief (10 minute) oral presentation

PROFESSOR'S PHILOSOPHY:

My main interest, within all of my professorial roles, is teaching. I consider myself to be a dedicated and enthusiastic instructor. I am considered to be demanding in expectations but fair in grading and evaluation by most of my past students. My classes tend to be rich in content and I present you with a lot of material from which to learn. For a specific list of materials and learning approaches used in this class, see the teaching style attachment later in the syllabus.

In return for the amount of work I put into resource and class preparation, I expect you to be willing to work hard in absorbing as much of the material as you can. I would much rather work with an interested and enthusiastic C or D student than a bored and uncooperative A or B student. If you work from this attitude, you and I will get along just fine. If, on the other hand, you view your university experience as simply paid admission to a diploma, you and I may have conflicting objectives and attitudes.

To this end, some of the points awarded in this class reflect how seriously you approach the learning process as a cooperative endeavor. Items included in this group of points are attendance, punctuality, enthusiasm and cooperation. Some of these points will be objectively tracked (e.g. attendance) and some are my subjective opinion. You will all start out with the maximum number of points pre-awarded in this area. As the end of the class approaches, a demerit system will be used if you have been deficient in these areas.

GRADING:

Each of the 7-8 field/lab exercises (along with any associated write-ups) will be worth 50 points (350-400 total) and will receive a weighted score based on:

- .9-1.0 * possible points (exceptional work, extra effort demonstrated)
- .7-.9 * possible points (meets basic requirements as described in the products)
- .5-.7 * possible points (incomplete or deficient in content)
- 0-.5 * possible points (unsatisfactory, very incomplete or very deficient in content)

Each project is normally due 1 week after it is assigned. **

Preliminary quiz is worth 50 points.

Two exams, each worth 100 points.*

The written report is worth 60 points.

The presentation is worth 40 points.

Cooperation, courtesy, attendance, promptness etc. is worth 50 points.

* Make-ups allowed only with valid excuse and prior instructor approval.

** A declining point scale will be applied to work turned in late.

850-900 points total possible with a guaranteed scale of A \geq 90%, B \geq 80%, C \geq 70%, D \geq 60%, F $<$ 60% or curved if necessary.

While a certain amount of student collaboration is encouraged in this class, the products turned in and the exams are to be the original work of the submitted. Anyone found plagiarizing or cheating will receive a grade of F.

TENTATIVE SCHEDULE:

| DATE | TOPIC | READING |
|---|---|---------------------------|
| Week #1, Jan 13-17 | <i>Overview and introduction</i> <i>Energy and mass considerations</i> | #4 preface #4 ch. 4, 8 |
| Week #2, Jan 20-24 (Jan 20, no class) Sat Jan 25 FT | <i>Winter weather, storm systems</i> Exercise #1 (l): The freezing of water Exercise #6 Lake Ice Lake Mary (vans 113 & 114) | #3 ch. 2 |
| Week #3, Jan 27-31 | <i>Precipitation, snowfall and new snow</i> Exercise #2 (l): Snow nucleation | #3 ch. 2, 3 |
| Week # 4, Feb 3-7 | <i>Snow on the ground #1: the seasonal snowpack</i> | #4 ch. 2 |
| Week #5, Feb 10-14 | <i>Snow on the ground #2, avalanches</i> | #3 ch. 4-5 |
| Week #6, Feb16-21 | Silverton field trip vans 37, 151 and 152 Exercise #3 (f): Structure of the snowpack Exercise #4 (f): Snow water equivalent (SWE) sampling Exercise #5 (f): Living in snow - snow as shelter Student field projects | #3 ch. 3 |
| Week #7, Feb 24-28 | <i>Snow and life</i> | #4 ch. 3-8 |
| Week #8 Mar 3-7 | Review and Exam #1, Dexter gone to AAG Mar 5 & 7 | |
| Week #9, Mar 10-14 | <i>Practical aspects of snow #1: recreation, engineering and safety</i> | |
| Mar 17-21 | Spring break, no class | |
| Week #10, Mar 24-28 Sat Mar 29 FT | <i>Practical aspects of snow #2: water resources</i> Exercise #4b (f): Snow water sampling, vans 114 & 127 | #1 |
| Week #11, Mar 31-Apr 4 | <i>Ice</i> Exercise #6 will be due here | #1 |
| Week #12, Apr 7-11 | <i>Glaciology</i> Exercise #7: Glaciers | #1 & #5 |
| Week #13, Apr 14-18 Sat Apr 19 FT | <i>Glaciated landscapes</i> Exercise #8: (f): Inner Basin on skis (vans 113 & 114) | #1 & #5 |
| Week #14 Apr 21-25 | Student Presentations | |
| Week #15 Apr 28-May 2 | Student Presentations | |
| Weds. May 7 | Final exam 7:30-9:30 A.M. | |

OUTDOOR EQUIPMENT ITEMS:

- warm, water resistant footwear without snug fit (Sorels, mountain boots etc.)
- three or four layers of clothing (a “*10 essentials*” item) for example:
 - underwear tops and bottoms (polypropylene is nice for colder conditions)
 - wool or synthetic shirt or sweater
 - a bulk insulating garment (down or poly fill sweater or vest)
 - a wind/water shell garment (tightly woven nylon, Dacron, polyester etc.)
 - warm pants (no cotton !!!)
- gaiters
- a sun hat and a knit ski hat
- light gloves and overmittens
- sunglasses (UV B filter) and/or goggles
- water bottle or canteen (1 or 2 quart) optional thermos (a “*10 essentials*” item)
- lunch and extra emergency food(a 10 essentials item)
- small pack

The more compact items of the “*10 essentials*” in a small bag:

- matches or lighter and candle
- small first aid kit
- sun screen
- small flashlight
- extra socks
- compass
- whistle
- map

In addition, a few simple tools will be of use including:

- a 5 to 10X hand lens
- a small patch of black velvet
- a small thermometer
- a medium to large blade scoop shovel.

For skiing activities:

- appropriate sized skis, boots, bindings and poles (Nordic and Alpine)

For overnight:

- a winter capable tent (optional)
- either a three season sleeping bag (rated to around +10 F) (snow cave)
- or a four season sleeping bag (rated to around -10 F) (tent)
- a foam sleeping pad (full length preferable)
- an LP or white gas cooking stove (with fuel), cooking pan and eating utensils
- additional food and water
- booties (optional)
- larger pack or duffel bag
- toiletries

NORTHERN ARIZONA UNIVERSITY POLICY STATEMENTS

SAFE ENVIRONMENT POLICY

NAU's Safe Working and Learning Environment Policy seeks to prohibit discrimination and promote the safety of all individuals within the university. The goal of this policy is to prevent the occurrence of discrimination on the basis of sex, race, color, age, national origin, religion, sexual orientation, disability, or veteran status and to prevent sexual harassment, sexual assault, or retaliation by anyone at this university. You may obtain a copy of this policy from the college dean's office. If you have concerns about this policy, it is important that you contact the departmental chair, dean's office, the Office of Student Life (523-5181), the academic ombudsperson (523-9368), or NAU's Office of Affirmative Action (523-3312).

STUDENTS WITH DISABILITIES

If you have a learning and/or physical disability, you are encouraged to make arrangements for class assignments/exams so your academic performance will not suffer because of the disability or handicap. If you have questions about special provisions for students with disabilities, contact the Counseling and Testing Center (523-2261). It is your responsibility to register with the Counseling and Testing Center. Application for services should be made at least eight weeks before the start of the semester. If the Counseling and Testing Center verifies your eligibility for special services, you should consult with your instructor during the first week in the semester so appropriate arrangements can be made. Concerns related to noncompliance with appropriate provisions should be directed to the Disability Support Services coordinator in the Counseling and Testing Center.

INSTITUTIONAL REVIEW BOARD

Any study involving observation of or interaction with human subjects that originates at NAU-including a course project, report, or research paper-must be reviewed and approved by the Institutional Review Board (IRB) for the protection of human subjects in research and research-related activities. The IRB meets once each month. Proposals must be submitted for review at least fifteen working days before the monthly meeting. You should consult with your course instructor early in the course to ascertain if your project needs to be reviewed by the IRB and/or to secure information or appropriate forms and procedures for the IRB review. Your instructor and department chair or college dean must sign the application for approval by the IRB. The IRB categorizes projects into three levels depending on the nature of the project: exempt from further review, expedited review, or full board review. If the IRB certifies that a project is exempt from further review, you need not resubmit the project for continuing IRB review as long as there are no modifications in the exempted procedures. A copy of the IRB Policy and Procedures Manual is available in each department's administrative office and each college dean's office. If you have questions, contact Carey Conover, Office of Grant and Contract Services, at 523-4889.

ACADEMIC INTEGRITY

The university takes an extremely serious view of violations of academic integrity. As members of the academic community, NAU's administration, faculty, staff, and students are dedicated to promoting an atmosphere of honesty and are committed to maintaining the academic integrity essential to the educational process. Inherent in this commitment is the belief that academic dishonesty in all forms violates the basic principles of integrity and impedes learning. Students are therefore responsible for conducting themselves in an academically honest manner. Individual students and faculty members are responsible for identifying instances of academic dishonesty. Faculty members then recommend penalties to the department chair or college dean in keeping with the severity of the violation. The complete policy on academic integrity is in Appendix F of NAU's Student Handbook.

AGREEMENT OF UNDERSTANDING:

I have read the course syllabus for GGR 451, Snow and Ice in our Environment. I have had the opportunity to ask questions about the syllabus and course. I understand the content of the syllabus and agree to be responsible for the requirements and course policies including the provision of my own adequate winter clothing and related outdoor equipment.

I further understand that some of the field exercises in GGR 451 involve moderate physical exertion in cold conditions. My signature indicates that I am aware of this situation and have informed the instructor of the course about any limitations or other concerns that I may have related to field work.

Signature_____

Printed name_____

SSN_____

Detach and turn in before the end of the second week of class to avoid administrative drop.