ICE PHYSICS - PHYS 614 (3 credits)

Prerequisites: Math 421, 422, graduate standing, and permission of instructor

Spring 2015, GI (Elvey), Rm 414

Instructor: Martin Truffer, Geophysical Institute 401 D, *5359
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office hours: by appointment

Text: A manuscript will be provided

Additional reading:

- Ice Physics (Hobbs)
- Physics of Ice (Petrenko and Whitworth)
- Creep and Fracture of Ice (Schulson and Duval)
- The Chemical Physics of Ice (Fletcher)
- Solid State Physics (Kittel)

Good online resources:

- http://www.lsbu.ac.uk/water
- http://www.snowcrystals.com

The course contains a survey of the physics of ice. Topics will include the crystal structure and properties of ice, high pressure phases, hydrogen bonding, mechanical properties, thermal properties, electrical and acoustic properties, nucleation and growth, optical properties, and surface properties (adhesion, friction).

The student is expected to become familiar with the basic physics of ice. We will develop an understanding of mechanical, thermal, electric, optical, and acoustic properties from basic physical principles.

Instructional methods: lectures and student presentations

Student presentations: Each student is expected to give one 30 minute presentation on a particular topic in ice physics. The topic should be discussed with the instructor, and a list of suggestions is given below. Finding a different topic is encouraged. The presentations should cover a literature review. A list of papers to be included for the review is due on Thursday, 5 February. At this point I will assign times for the presentations.

Course outline:

- Introduction, why study ice?
- The H_2O molecule
- Ice Ih architecture, crystallography
- Phase diagram, different kinds of ice
- Defects
- Optical properties
- Electrical properties
- Thermal properties
- Mechanical properties
- Surface of ice
- Nucleation
- Snow transformation

Possible topics for student presentations (finding your own topic is encouraged):

- Ice in the solar system
- Life at sub-freezing temperatures (cryo-biology)
- High pressure forms of ice
- Radar studies of glacier ice
- Frost heave and ice lens formation
- Friction and adhesion of ice
- Atmospheric haloes
- Grain growth in ice sheets

Class attendance is mandatory and participation encouraged.

Grading:	Problem sets:	50%
	Student presentations:	25%
	Final Exam:	20%
	Participation:	5%

The final exam will be in the form of an extended homework.

This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates and myself. Rather than emailing

questions to me, I encourage you to post your questions on Piazza. If you have any problems or feedback for the developers, email team@piazza.com.

Find our class page at: https://piazza.com/uaf/spring2015/phys614/home

The Office of Disability Services implements the Americans with Disabilities Act (ADA), and insures that UAF students have equal access to the campus and course materials. Please let the instructor know if you need special accommodation.