

Viewpoints in Environmental Studies: Basics of Heat Pump Systems – ENVI F150

University of Alaska Fairbanks | Bristol Bay Campus

Fall 2020

1 credit

Instructor Information

Name: Mark Masteller

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Office Location and Hours: Call or email for an appointment.

Course Meeting Information

Dates: Sept. 30 – Oct. 28

Day and Time: Wednesday, 5:20-8:00pm

Class Location: ONLINE – at your own computer

Course Description

Presents basics of heat pump (geoexchange) systems and their use for space heating/cooling and domestic hot water production. Included both ground-source and air-source heat pumps. Introduces physical concepts related to harvesting shallow earth energy, system components, common installation configurations, cost/benefit considerations, and safety.

Course Prerequisite/Co-requisites: None – students do not need to have any previous knowledge.

Required Text and Learning Materials: Lloyd, D. B. (2015). Geo Power: stay warm, keep cool and save money with geothermal heating and cooling. Pixyjack Press, Colorado, USA. Print ISBN is 978-1-936555-58-1. E-publication ISBN is 978-1-936555-60-4.

Other class materials provided by instructor via Blackboard.

Student Learning Outcomes: In this class, learning requires partnership. For each hour spent in class, plan to spend at least two hours studying outside of class each week. At the end of this course, if you actively engage in class, study outside of class, complete assignments and prepare for exams, you will be able to:

1. Describe the fundamental components, and their functions, of ground- and air-source heat pump systems
2. Explain the relationship of energy efficiency measures and heat pump system development
3. Describe the general development, design and installation considerations for residential heat pump systems
4. Discuss basic heat pump system operation, maintenance, and safety considerations

Instructional Methods

This course will include lectures, discussions, homework, readings, handouts and classroom demonstration.

Grading

This class is graded on a Pass-Fail scale. Grading will be based upon a percentage of the total points earned for quizzes, homework and attendance. You must achieve a score of 70% or better to pass. Your grade will be determined as follows:

Attendance and participation.....30%

Students are expected to attend all class sessions and actively participate in group discussions

Homework30%

Homework assigned as needed, covering material in lectures and the text.

Final Exam40%

Exam will be open book, open notes and may cover all material presented in the course.

Course Policies

Assignments and Course Schedule

The instructor reserves the right to change the assignment requirements and exam dates depending upon class progress.

Assignment due dates are shown on the course schedule.

Classroom Rules

1. Students are expected to comply with the UAF Student Code of Conduct: <https://uaf.edu/deanofstudents/student-code-of-conduct/>
2. Cellphones are to be turned off and put away. Do not take them out during class. If used, laptops and tablets may only be used to take notes.
3. Be on time. Late entrances disrupt others.
4. No eating in class. Beverages in closed containers are acceptable.
5. Please respect the rights of others to learn. Behaviors that distract attention from lecture or class activities will not be tolerated. Conduct that unreasonably interferes with the learning environment or that violates the rights of others is prohibited by the standards and guidelines collectively described as the UA Student Code of Conduct.
6. No children, pets, or guests are permitted to attend class.

Attendance

Regular attendance is necessary for success at the collegiate level. You are expected to actively participate in all classroom sessions. Make sure that you are prompt and that you stay for the scheduled class time. Experience has shown that due to the time constraints of this course your grade will be jeopardized if you are absent from class.

Blackboard

Blackboard will be used for announcements and posting of your grades.

University Policies and Services

Academic Integrity

Academic integrity is a basic principle that requires that students only take credit for ideas and efforts that are their own. Cheating, plagiarism, and other forms of academic dishonesty are defined as the submission of materials in assignments, examinations, or other academic work that is based on sources prohibited by the faculty member. Substantial portions of academic work that a student has submitted for a course may not be resubmitted for credit in another course without the knowledge and advance permission of the instructor. For more information, refer to the UAF Student Code of Conduct: <https://uaf.edu/deanofstudents/student-code-of-conduct/>

Student Protections and Services

Every qualified student is welcome in my classroom. As needed, I am happy to work with you, disability services, veterans' services, rural student services, etc to find reasonable accommodations. Students at this university are protected against sexual harassment and discrimination (Title IX), and minors have additional protections. As required, if I notice or am informed of certain types of misconduct, then I am required to report it to the appropriate authorities. For more information on your rights as a student and the resources available to you to resolve problems, please go the following site: www.uaf.edu/handbook/.

Course Schedule

A detailed course schedule is posted on Blackboard. The following gives you an idea of the general content and flow of the course

General Course Calendar/Outline

2020-09-22

NOTE: The instructor reserves the right to change the assigned readings, homework, and exam dates based upon class progress and student need for more practice on specific concepts.

Course Content
Part 1 - Blackboard Collaborate, introductions, goals, expectations, motivations, syllabus, schedule, text, Sustainable Energy program (PPT 1) Part 2 – Terminology, energy source, history, general applications (PPT 2) Part 3 – Energy price/cost, inflation rates, life cycle costing, electricity in Alaska (PPT 3) Part 3 - Energy basics, cost of operations, , big-picture benefits, transfer of heat, energy conservation, economics Part 4A – Science and technology of heat pumps – inside the Heat Pump Part 4B - Science and technology of heat pumps – Efficiency Part 6 – General system components Part 7 – Earth energy collection systems Part 8 – Some case studies (GSHP) Part 9 - GSHP advantages/disadvantages Part 10 – Air-source heat pumps Part 11 – Industry considerations; safety, operations, maintenance Part 12 – Final Exam Other topics: Decision calculators Heat pump water heaters and clothes dryers
Activities and assignments
<i>Homework:</i> <i>Will be assigned during our class times and available via blackboard</i> <i>Final Exam:</i> <i>Will be available via Blackboard</i>
Handouts provided for class: Reading Materials <ul style="list-style-type: none">• Heat Pump Primer: why electric heating finally makes sense – Home Power Magazine #149, June/July 2012• Color diagram – inside the heat pump• Life Cycle Costing examples• AKWarm Energy Flows example

