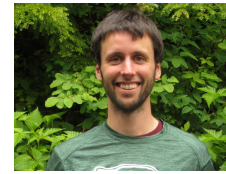




Basics of Heat Pump Systems, ENVI F174

1 credit
Fall, 2022



Course Goals

Basics of Heat Pump Systems will be a success if students:

1. Learn the fundamental principles of the technology
2. Learn the relationship between home energy efficiency and heat pumps
3. Learn how to evaluate the financial and carbon impacts of heat pump investments
4. Learn the basic design and installation considerations for heat pump systems.
5. Learn heat pump system operation and maintenance practices

Logistics

| | | | |
|--|-------------------|-------------------------|-----------------------------|
| <i>Instructor:</i> | Chandler Kemp | <i>Office Location:</i> | Bristol Bay Campus Room 110 |
| <i>Email:</i> | ckemp6@alaska.edu | <i>Dates:</i> | September 22-October 20 |
| <i>Office Hours:</i> 2:30-4:30 PM Thursdays | | | |
| <i>Online:</i> https://alaska.zoom.us/j/85818752895?pwd=aTNzYzdlbm13RDNUcFkrdmEwbFJrUT09 | | | |
| <i>Telephone:</i> | 907-842-8303 | <i>Course Type:</i> | Synchronous Online |
| <i>Course Location:</i> | Online (Canvas) | <i>Meeting Time:</i> | Thursdays 5:20-8:00 PM |

Prerequisites

No prerequisites! If you want to learn about energy use in homes, there is space for you in this class.

Course description

Basics of Heat Pump Systems explores how heat pumps work, how heat pumps fit into home energy systems, the financial and environmental considerations, installation and design considerations and heat pump system operation and maintenance. The course addresses air, water and ground source heat pumps.

COVID-19 statement

Students should keep up-to-date on the university’s policies, practices, and mandates related to COVID-19 by regularly checking [this website](#). Further, students are expected to adhere to the university’s policies, practices, and mandates and are subject to disciplinary actions if they do not comply.

Course Calendar



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| Date | Topics covered in class | Assignment Given | Assmt Due | Learning Outcomes |
|-------|--|------------------|-----------|-------------------|
| 9-22 | Part 1: Introductions, expectations, motivations Activity 1: The hottest part of a refrigerator Part 2: Where the energy comes from, history and examples | | - | 1 |
| 9-29 | Part 3: Heating system energy costs Activity 2: A picture of your heat source Demo: That's impossible! Part 4: Heat pump principles | | | 1, 3 |
| 10-6 | Part 5: System components Part 6: Air source heat pumps Activity 3: Take a picture of where you would put indoor and outdoor units in your home Part 7: Life cycle analysis | | | 1, 2, 3 |
| 10-13 | Part 8: Water and ground source heat pumps Activity: jumping jacks and oil costs Part 9: Commercial heat pump case study | | | 4 |
| 10-20 | Part 10: Industry considerations, operations and maintenance Activity: One maintenance activity that affects your home heating system. Part 11: Case Studies | | | 4, 5 |

Evaluation

Students will be evaluated based on participation (30%), homework (30%) and final exam (40%).

Course Policies

| | Students | Faculty |
|------------|---|---|
| Coursework | Submit assignments on time, and communicate if there's going to be a delay. | Return all assignments within one week. |



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| | | |
|---------------------|--|--|
| | 1 free late day on individual assignments (they can be returned up to one week later). After that there is a 20% penalty per week. | |
| Attendance | If you miss class, speak with the faculty about how to make up the work | If I have to miss a class, I'll offer an optional make up session. |
| Tardiness | Being on time is part of the participation grade | Being on time is part of my responsibility to you |
| Class Participation | If you make one on-topic question or comment in every class you'll do well | I'll listen to every on-topic question or comment you make. |
| Extra credit | 1 bonus point if you make a recommendation to improve this syllabus. There will be more extra credit opportunities. | Instructors don't get extra credit! |

In-depth Course description

Heat pumps are growing in popularity for commercial buildings and single family homes. This course introduces the fundamental principles that the technology relies on as well as practical considerations for deciding whether to invest in a heat pump and designing, installing and maintaining the system. The course is online with weekly synchronous meetings. Classes will be a combination of lecture, discussion and activities. There are four weekly homework assignments and a final exam.

Representative Course Readings/Materials

Various readings available via canvas.

Some readings will come from the text below, available for purchase online for less than \$20:

Cantor, John. Heat Pumps for the Home: 2nd Edition. Crowood Press. 2021.

Technology Requirements

I am eager to help students overcome any technological barriers to participating in class. That being said, access to the internet will be very helpful during this course. Course materials will be shared over the online service Canvas, and courses will be held over Zoom. Some of the course materials will be videos for streaming. If access to these resources is a barrier for you, please contact me so that I can help!

Student Learning Outcomes

1. Learn the fundamental principles of the technology
2. Learn the relationship between home energy efficiency and heat pumps
3. Learn how to evaluate the financial and carbon impacts of heat pump investments



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4. Learn the basic design and installation considerations for heat pump systems.
5. Learn heat pump system operation and maintenance practices

Instructional Methods

This course relies on a combination of lecture, homework, activities and demonstrations.

Explanation of Student Effort

Students will spend 2 hours and 40 minutes per week with the instructor. Additional time will be required outside of class to study and complete assignments.

Plagiarism And Academic Integrity

Academic dishonesty applies to examinations, assignments, laboratory reports, fieldwork, practicums, creative projects, or other academic activities. Examples include, but are not limited to:

- a) presenting as their own the ideas or works of others without proper citation of sources;
- b) utilizing devices not authorized by the faculty member;
- c) using sources (including but not limited to text, images, computer code, and audio/video files) not authorized by the faculty member;
- d) providing assistance without the faculty member's permission to another student, or receiving assistance not authorized by the faculty member from anyone (with or without their knowledge);
- e) submitting work done for academic credit in previous classes, without the knowledge and advance permission of the current faculty member;
- f) acting as a substitute or utilizing a substitute;
- g) deceiving faculty members or other representatives of the university to affect a grade or to gain admission to a program or course;
- h) fabricating or misrepresenting data;
- i) possessing, buying, selling, obtaining, or using a copy of any material intended to be used as an instrument of assessment in advance of its administration;
- j) altering grade records of their own or another student's work;
- k) offering a monetary payment or other remuneration in exchange for a grade; or
- l) violating the ethical guidelines or professional standards of a given program.

For more, see [Students Rights and Responsibilities](#).

Classroom etiquette and student behavior guidelines.

Please be kind 😊.

Extended Absence Policy

Extended absences are defined as missed classes or course work by students beyond what is permissible by the instructor's written course policies. Students may need to miss class and/or course work for a variety of reasons, including, but not limited to:



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- bereavement
- personal illness or injury
- serious illness of a friend, family member or loved one
- military obligations
- jury service
- other emergency or obligatory situations

For more information, go to the student handbook or the Center for Students Rights and Responsibilities.

UAF Incomplete Grade Policy:

Your instructor follows the University of Alaska Fairbanks Incomplete Grade Policy:

"The letter "I" (Incomplete) is a temporary grade used to indicate that the student has satisfactorily completed (C- or better) the majority of work in a course but for personal reasons beyond the student's control, such as sickness, has not been able to complete the course during the regular semester. Negligence or indifference are not acceptable reasons for an "I" grade."

For more information, see [the UAF regulations regarding grades](#).

Student Protections Statement

UAF embraces and grows a culture of respect, diversity, inclusion, and caring. Students at this university are protected against sexual harassment and discrimination (Title IX). Faculty members are designated as responsible employees which means they are required to report sexual misconduct. Graduate teaching assistants do not share the same reporting obligations. For more information on your rights as a student and the resources available to you to resolve problems, please go to the following site:

<https://catalog.uaf.edu/academics-regulations/students-rights-responsibilities/>

Disabilities Services Statement

I will work with the Office of Disability Services to provide reasonable accommodation to students with disabilities. The Office of Disability Services implements the Americans with Disabilities Act (ADA), and ensures that UAF students have equal access to the campus and course materials. I will work with the Office of Disabilities Services (208 Whitaker, 907-474-5655) to provide reasonable accommodation to students with disabilities uaf.edu/disability/

Non-Discrimination Statement

The University of Alaska is an affirmative action/equal opportunity employer and educational institution. The University of Alaska does not discriminate on the basis of race, religion, color, national origin, citizenship, age, sex, physical or mental disability, status as a protected veteran, marital status, changes in marital status, pregnancy, childbirth or related medical conditions, parenthood, sexual orientation, gender



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identity, political affiliation or belief, genetic information, or other legally protected status. The University's commitment to nondiscrimination, including against sex discrimination, applies to students, employees, and applicants for admission and employment. Contact information, applicable laws, and complaint procedures are included on UA's statement of nondiscrimination available at www.alaska.edu/nondiscrimination. For more information, contact:

UAF Department of Equity and Compliance

1760 Tanana Loop, 355 Duckering Building, Fairbanks, AK 99775

907-474-7300

uaf-deo@alaska.edu

Student Academic Support

- **[Speaking Center](#)**
 - 907-474-5470
 - uaf-speakingcenter@alaska.edu
 - Gruening 507
- **[Writing Center](#)**
 - 907-474-5314
 - uaf-writing-center@alaska.edu
 - Gruening 8th floor
- **[UAF Math Services](#)** (math fee paying students only)
 - uafmathstatlab@gmail.com
 - Chapman Building
- **[Developmental Math Lab](#)**
 - CTC, Room 120, 604 Barnette Street
 - Gruening 406
- **[The Debbie Moses Learning Center](#)** at CTC
 - 907-455-2860
 - 604 Barnette St, Room 120
- **[Elmer E. Rasmuson Library](#)** (help with research)
 - 907-474-7481 (phone)
 - 907-341-4404 (text)
 - AskRasmusonLibrary@uaf.libanswers.com
 - 1732 Tanana Loop
- **[Rural Student Services](#)**
 - uaf-rss@alaska.edu
 - [Tutoring Services](#)
 - Main floor Brooks Building
- **[Student Support Services](#)**
 - (907) 474-6844
- **[eCampus Student Services](#)**
 - 907-479-3444



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- toll free 1-800-277-8060
- [contact staff directly](#)
- **[Veterans Resources Center](#)**
- 907-474-2475
- Rm 111, Eielson Building.
- **[Academic Advising Resource List](#)**

Other Student Resources:

- **[Disability Services](#)**
- 907-474-5655
- uaf-disability-services@alaska.edu
- Whitaker 208
- **[Student Health & Counseling](#)** [6 free counseling sessions]
- 907-474-7043
- [Appointments](#)
- Whitaker 203
- **[Center for Student Rights and Responsibilities](#)**
- 907-474-7317
- uaf-studentrights@alaska.edu
- Eielson 110
- **[ASUAF Student Government](#)**
- 907-474-7355
- asuaf.office@alaska.edu
- Wood Center 119

University Sponsored Off-Campus Programs and Research Activities

We want you to know that:

1. UA is an AA/EO employer and educational institution and prohibits illegal discrimination against any individual: www.alaska.edu/nondiscrimination.
2. Incidents can be reported to your university's Equity and Compliance office (listed below) or online reporting portal. University of Alaska takes immediate, effective, and appropriate action to respond to reported acts of discrimination and harassment.
3. There are supportive measures available to individuals that may have experienced discrimination.
4. University of Alaska's Board of Regents' Policy & University Regulations (UA BoR P&R) 01.02.020 Nondiscrimination and 01.04 Sex and Gender-Based Discrimination Under Title IX, go to: <http://alaska.edu/bor/policy-regulations/>.
5. UA BoR P&R apply at all university owned or operated sites, university sanctioned events, clinical sites and during all academic or research related travel that are university sponsored.



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For further information on your rights and resources [click here](#).

Title IX

University of Alaska Board of Regents have clearly stated in BOR Policy that discrimination, harassment and violence will not be tolerated on any campus of the University of Alaska. If you believe you are experiencing discrimination or any form of harassment including sexual harassment/misconduct/assault, you are encouraged to report that behavior. If you report to a faculty member or any university employee, they must notify the UAF Title IX Coordinator about the basic facts of the incident.

Your choices for reporting include:

1. You may access confidential counseling by contacting the UAF Health & Counseling Center at 907-474-7043;
 2. You may access support and file a Title IX report by contacting the UAF Title IX Coordinator at 907-474-6600;
 3. You may file a criminal complaint by contacting the University Police Department at 907-474-7721.
- For more information please visit the [UAF Department of Equity and Compliance](#) webpage.

Any UAF employee or volunteer who reasonably suspects or observes minor abuse or maltreatment is required to report the incident. Reporting procedures are available on the UAF Protection of Minors. Violation of this policy by employees shall be reported as well.

Emergency Notification Plan

Students will receive emergency notifications via phone or email. Please check your uonline account to confirm your emergency notification settings. for more information, please refer to the student handbook. In cases where you do not have access to your devices, as your instructor, I will take responsibility to relay any emergency notifications.