

Home Energy Basics – ENVI F120

University of Alaska Fairbanks | Bristol Bay Campus
October 2020 1 credit (BD2 CRN 78352)

Instructor Information

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

Course Meeting Information

Dates: October 19 – November 16, 2020

Day and Time: Monday 5:20 – 8:00 PM (13.3 hrs instruction)

Class Location: Bristol Bay Campus UAF, Distance Delivery

Catalog Course Description

Presents an overview of space heating and electricity use and production for Alaskan homes and small businesses. Includes fundamentals of building energy flows, energy efficiency, and methods for decreasing fossil fuel consumption. Introduces the relationship between efficiency measures and renewable energy systems.

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

Required Text and Learning Materials: **No required text** – materials provided by instructor include:

- Alaska Energy Authority/Alaska Housing Finance Corporation. (2019). *Energy savers tips for Alaska* (4th ed.). Anchorage, AK.
- Various readings – provided in person and via Blackboard

Optional Text: Amann, J. T. (2007). *Consumer guide to home energy savings* (9th ed.). Gabriola Island, Canada: New Society.

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. Recognize basic science concepts related to energy flows
2. Identify types of basic energy monitoring tools and demonstrate their use
3. Discuss energy improvement options with respect to both space heating and electricity
4. Describe the relative priority of deploying energy efficiency measures and renewable energy systems
5. Discuss general costs and benefits of reducing fossil energy use
6. Perform basic life cycle assessment calculations relative to energy use scenarios and decisions

Instructional Methods

This course will include distance delivered lectures, discussions, homework, readings, handouts and demonstrations.

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.....20%

Students are expected to attend the entire 3-day classroom session and actively participate in group discussions

Homework20%

Homework assigned as needed. Each student will use an energy monitoring tool (typically a Kill-A-Watt meter) provided by the instructor to measure electrical consumption of an appliance of the student's choice (e.g. a refrigerator in her/his home), and based on the collected data make projections about the annual electricity consumption and associated cost.

Quizzes.....20%

There will be two short quizzes, which may be administered in class or as take-home quizzes.

Final Exam40%

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

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.

Course Policies

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 unless necessary. Laptops, cellphones, tablets, and PC's should only be used for taking notes, research, or other class related items.
3. Be on time. Late entrances disrupt others.
4. Be considerate of your microphone and video feeds while in the class. Please turn the microphones off if you are not speaking.
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. This is a distance delivery class, understanding that there are elements of your homelife that will be present, please do your best to limit distractions to yourself and others. No children, pets, or guests should be disrupting the class. Do your best to treat this scenario as if you were in a classroom away from home. This will be more conducive to you and everyone else's learning environment.

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.

Technology Requirements

Blackboard and Zoom

Blackboard will be used for announcements and posting of your grades. Zoom may be required due to unforeseen difficulties. Please download any applicable software for these applications and use them prior to beginning the first class section. It is the student's responsibility to be prepared for class. Anyone having difficulties know that you are welcome to contact me. However, the best source of most complex or sign-in resolutions will be the OIT (<https://www.alaska.edu/oit/get-help/>)

Email

Upon registration for any UAF class, a UAF email will be generated for you. Please use this email for correspondence, Blackboard and other items of communication when possible.

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 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/

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://www.uaf.edu/handbook/>

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. <https://uaf.edu/oeo/civil-rights/aa-eo/>

COVID-19, Addition and Policy

Students should keep up-to-date on the university's policies, practices, and mandates related to COVID-19 by regularly checking this website: <https://sites.google.com/alaska.edu/coronavirus/uaf/uaf-students?authuser=0> 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/Outline

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 - Course goals & objectives, syllabus, introductions, expectations, motivations, Demand-side/Supply-side of energy, Energy sources (PPT 1)
Part 2 - Energy flows in typical home, and ways to affect flows (PPT 2)
Part 3 - Basic physics of electricity (PPT 3) – includes class exercise and quiz; and practice with Kill-a-Watt meter
Part 4 – Basic physics of heat (PPT 4) - includes class exercise and (possibly) quiz
Part 5 - Basic building science: air flow, moisture, condensation (PPT 5) – Videos: <i>Grandma's House</i> ; <i>Lungs for your house</i>
Part 6 - Energy monitoring tools (PPT 6)
Part 7 - Understanding energy bills; benchmarking, Power Cost Equalization program (PPT 7)
Parts 8 & 9 - Lighting and appliances at home (PPTs 8&9)
Part 10 - Home energy audit, and audit program(s) (PPT 10)
Part 11 - Home Retrofits, Windows & Doors, Life-cycle cost example (PPTS 11A, B & C)
Part 12 - Other Efforts and Resources (PPT 12)
Part 13 - Home renewable energy – passive and active (PPT 13)
Part 14 – Final Exam
Activities and assignments

Homeworks:

1. **Read through entire booklet – *Energy Savers Tips for Alaska***
2. If possible, bring a recent copy of your electric and heating bill

Class Exercises & Other Reading

3. Class exercises & quizzes – electricity and heat loss
4. Read: *Tight houses, efficiency and indoor air quality – HP 148 2012; Phantom Load*
5. In-class insulation calculation exercise
6. Review Kill-a-watt meter exercise
7. Discuss Kill-a-watt meter exercise
8. **Final Exam**

Outside Class Activity: Use Kill-A-Watt meter to measure use/cost of some appliance

Handouts provided for class:

Reading Materials

- ***Energy Savers Tips for Alaska, 3rd ed. (2014)***
- *Tight houses, Efficiency & Indoor Air Quality (Home Power 148, 2012)*
- *Gimme Shelter - AHFC*
- *Phantom Load*
- Home Energy Rating example (pre- and post-audit)
- Urban to Rural – HP 133 2009

Exercises and Quizzes/Exams

- Electricity Exercise
- Heat transfer exercise (conductive heat loss)
- Quiz 1 - electricity
- Quiz 2 – more insulation (conductive heat loss)
- Final Exam

Additional Resources FYI:

Alaska Housing Finance Corporation (AHFC) Youtube channel - <https://www.youtube.com/user/akhousing/videos>

Energy rating – AHFC-Energy Efficiency-Blower Door Test (4:06 min) video - <https://www.youtube.com/watch?v=O-LzoBN3FWA>

Basic building diagnostics – AHFC-Pressure Series-Building Diagnostics (Blower door; 4:28 min) video - <https://www.youtube.com/watch?v=ixUk259DiJQ>

Cold Climate Housing Research Center – cchrc.org. LOTS of information – research reports, videos, etc.

Canada Mortgage Housing Corporation – cmhc.ca. More research, videos, etc.

How to Use a Kill-a-watt meter. Youtube channel : <https://www.youtube.com/watch?v=5RidqDiljho>

Kill-a-watt meter and phantom power. <https://www.youtube.com/watch?v=ksW-0UUiw9w>