

HART 2449 Heat Pumps

Please Note: Due to extenuating circumstances, including public health issues, course and testing delivery methods, instructional schedules, housing contracts, campus procedures and/or operating hours may be altered, interrupted and/or ceased for a limited or extended period of time. Such changes will be posted on the College website.

Course Syllabus

Type of Course/Delivery Mode/Testing Requirements

Face-to-Face course: Lecture- 3 hrs./week on campus, Lab- 2 hrs./week on campus.

Testing may be conducted wherever an internet connection is available or in a classroom setting.

Professor Contact Information

James Popplewell

Office: (903)463-8713 (Call for appointment)

Email: popplewellj@grayson.edu

Hours: Mon-Thurs 7:30am-10:00pm

Course Pre-requisites

HART 1401-Electricity Principles for HVAC

HART 1407-Refrigeration Principles

Course Description – from the college catalog

A study of heat pumps, heat pump control circuits, defrost controls, auxiliary heat, airflow, and other topics related to heat pump systems. The student will be able to explain a reverse cycle system; list the mechanical and electrical components for the heat pump operation; and explain the operation of heat pump modes including cooling, heating, defrost, emergency heat, and auxiliary heat mode. Identify and explain the different methods of accomplishing defrost; charge a system correctly in the heating and cooling mode; troubleshoot electrical and mechanical components; perform tests for

adequate airflow, and determine the balance point and co-efficiencies of performance (C.O.P.); and define attributes of geothermal heat pump systems.

Student Learning Outcomes

Explain a reverse cycle system; list the mechanical and electrical components for the heat pump operation; and explain the operation of heat pump modes including cooling, heating, defrost, emergency heat, and auxiliary heat mode. Identify and explain different methods of accomplishing defrost; charge a system correctly in the heating and cooling mode; troubleshoot electrical and mechanical components; perform tests for adequate air flow; and determine balance point and coefficient of performance (C.O.P.); and define attributes of geothermal heat pump systems.

Required Textbooks (ISBN # included) and Materials



Heat Pumps , 2nd Edition

Eugene Silberstein

ISBN-10: 1-305-08163-3

ISBN-13: 978-1-305-08163-5

Pen/pencil, notebook paper, calculator

Volt/Ohm meter, Ammeter, hand tools (list provided)

Outline of Topics Covered

VAPOR-COMPRESSION REFRIGERATION SYSTEM COMPONENTS
VAPOR-COMPRESSION REFRIGERATION SYSTEM ACCESSORIES AND CONTROLS
VAPOR-COMPRESSION HEAT-PUMP COMPONENTS AND ACCESSORIES
INTRODUCTION TO AIR-SOURCE HEAT-PUMP SYSTEMS
WIRING DIAGRAMS FOR AIR-CONDITIONING AND AIR-SOURCE HEAT-PUMP SYSTEMS
AIR-TO-AIR HEAT-PUMP SYSTEM INSTALLATION
AIR-SOURCE HEAT-PUMP SYSTEMS: MECHANICAL TROUBLESHOOTING
TROUBLESHOOTING AIR-SOURCE HEAT-PUMP SYSTEM
ELECTRICAL COMPONENTS AND CONTROL CIRCUITS
AIR-SOURCE HEAT-PUMP SYSTEMS: PREVENTIVE MAINTENANCE
SERVICING VAPOR-COMPRESSION REFRIGERATION SYSTEMS
INTRODUCTION TO WATER-SOURCE HEAT-PUMP SYSTEMS
WATER-SOURCE HEAT-PUMP SYSTEM WIRING DIAGRAMS
WATER-SOURCE HEAT-PUMP SYSTEM INSTALLATION

WATER-SOURCE HEAT-PUMP SYSTEM TROUBLESHOOTING
WATER-SOURCE HEAT-PUMP SYSTEMS: PREVENTIVE MAINTENANCE
WATER-SOURCE HEAT-PUMP SYSTEMS: SAMPLE SERVICE CALLS
INTRODUCTION TO GEOTHERMAL HEAT-PUMP SYSTEMS
GEOTHERMAL HEAT-PUMP SYSTEM INSTALLATION

GEOTHERMAL HEAT-PUMP SYSTEMS: TROUBLESHOOTING
GEOTHERMAL HEAT-PUMP SYSTEMS: SAMPLE SERVICE CALLS

Methods of Instruction

- Methods of instruction include lecture, discussion, demonstration, student performance and research.
- The student is required to read text assignments, perform applied arithmetic and mathematical operations, listen and participate in discussions in class.
- Instructional aids include Related lab equipment, computer systems, and product cutaways.

Methods of Evaluation

The student will be evaluated on the basis of his/her achievement in the classroom and performance in the laboratory. Module tests will be given at the time the student completes each unit of instruction. Performance grades will be given at the completion of each unit of instruction. The types of tests include both objective and subjective.

Class Attendance

Academic success is closely associated with regular classroom attendance and course participation. All successful students, whether on campus or online, are expected to be highly self-motivated. All students are required to participate in courses regularly and are obliged to participate in class activities and complete and submit assignments following their professors' instructions. Responsibility for work missed because of illness or school business is placed upon the student.

If a student is late more than 15 minutes to class that student will be counted absent even if you elect to stay for the remaining of the class instruction unless the instructor was notified in writing via email at poppplwelli@grayson.edu 30 minutes prior to scheduled class.

Grades and Grade Points:

Grayson County College uses the following system:

A —The student demonstrates mastery of course content and meets course objectives.

B —The student demonstrates mastery of course content and meets selected objectives.

C —The student demonstrates acceptable competency in coursework and meets selected course objectives.

D —The student demonstrates minimal performance in course work and does not meet course objectives.

F —Failure. No credit is given for the grade of F.

I —Incomplete. The grade of I indicates that the student has a valid excuse for failure to complete the work required during the semester. Incomplete work should be completed within the regular term. Failure to remove an “I” during the succeeding regular term may result in an F being placed on the permanent record.

W - Withdrawal from courses.

Any student struggling to obtain a minimum grade of “C” at the 8-week level should meet with the instructor to find assistance.

Assignment of letter grades corresponding to the numeric grading of course:

A	90 and above
B	80 – 89
C	70 - 79
D	60 - 69
F	59 and below

Categories	Percentage
3 Exams, Unit Pop quizzes	40%
Daily Work (MindTap, Labs)	45%
Attendance/Online	15%

Homework turned in for grading will be graded and posted within 24-48 hours and your papers will be returned at next scheduled class meeting.

Course & Instructor Policies

Students are expected become familiar with the student handbook dealing with rules and regulations. A link to the handbook can be found in Blackboard under student services.

- Students are expected to maintain classroom decorum that includes respect for other students and the instructor, prompt and regular attendance, and an attitude that seeks to take full advantage of the educational opportunity.
- Each student must have a current textbook as required in the course.
- Each student must obtain personal hand tools as required in the course.
- Students will not be allowed to participate in lab functions without personal hand tools.
- Please program all pagers and cell phones to the “silent” mode during class periods.
- Due to the hazardous nature of your career training, safety is a priority. Horseplay and any conduct that might jeopardize your safety or others around you are prohibited.
- When using refrigerant or other pressurized substances, torches, soldering, sawing, filing, using the hammer etc., gloves and safety glasses will be worn by the student.
- Grayson College has policies governing possession and use of narcotics, alcohol, and hallucinatory drugs. These policies will be strictly enforced.

Non-compliance with the above-listed policies will be grounds for administrative withdrawal from the HART program.

Academic Integrity

The faculty expects from its students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrates a high standard of individual honor in his or her scholastic work.

Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, or the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.

The instructors of this department do not condone and highly discourage any of the above activities. If caught in the act, the following actions may be taken:

- **First offense: The removal of the assignment from the student(s) and a Zero for the assignment with no chance to make up.**
- **Second offense: The removal of the student(s) from the class with a failing grade for the course.**

STUDENT BEHAVIOR

“Disorderly Conduct” “Disorderly conduct” shall include any of the following activities occurring on premises owned or controlled by the College District:

1. The behavior of a boisterous and tumultuous character such that there is a clear and present danger of alarming persons where no legitimate reason for alarm exists.
2. Interference with the peaceful and lawful conduct of persons under circumstances in which there is a reason to believe that such conduct will cause or provoke a disturbance.
3. Violent and forceful behavior at any time such that there is a clear and present danger that free movement of other persons will be impaired.
4. Behavior involving personal abuse or assault when such behavior creates a clear and present danger of causing assaults or fights.
5. Violent, abusive, indecent, profane, boisterous, unreasonably loud, or otherwise disorderly conduct under circumstances in which there a reason to believe that such conduct will cause or provoke a disturbance.
6. Willful and malicious behavior that interrupts the speaker of any lawful assembly or impairs the lawful right of others to participate effectively in such assembly or meeting when there a reason to believe that such conduct will cause or provoke a disturbance. This includes speaking out of turn on a continuous basis.
7. Willful and malicious behavior that obstructs or causes the obstruction of any doorway, hall, or any other passageway in a College District building to such an extent that the employees, officers, and other persons, including visitors, having business with the College District are denied entrance into, exit from, or free passage in such building.

<http://www.grayson.edu/files/documents/Student%20Handbook%202015.pdf> (Links to an external site.)

Withdrawal from Class

The administration of this institution has set deadlines for withdrawal from any college-level courses. These dates and times are published in that semester's schedule of classes. Administrative procedures must be followed. It is the student's responsibility to handle student-initiated withdrawal requirements from any class. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if

you choose not to attend the class once you are enrolled (see GCC College Catalog for details). **In accordance with the College's Developmental Education Plan, students withdrawn from their only developmental course will be withdrawn from all academic courses.** In addition, students' eligibility to receive financial aid or live in a College dormitory can be affected by withdrawal from courses. When administrative withdrawal occurs, any tuition refund would be made in accordance with state regulations.

Financial Aid

Effective July 1, 2000, students receiving Title IV funds (Pell, Federal Grants, and Student Loans), who subsequently withdraw from classes, will be required to return a portion of the federal financial aid received. Only the percentage of aid earned (determined by the percentage of time attended) will be eligible for retention on the student's behalf. Any aid that is not earned must be returned to its source. If there is a student account balance resulting from these adjustments, the student is responsible for payment. Further details can be obtained from the Office of Financial Aid.

Drop Rule

Under section 51.907 of the Texas Education Code, "an institution of higher education may not permit a student to drop more than six courses, including any course a transfer student has dropped at another institution of higher education." This statute was enacted by the State of Texas in spring 2007 and applies to students who enroll in a public institution of higher education as first-time freshmen in fall 2007 or later. Any course that a student drops is counted toward the six-course limit if (1) the student drops a course after census date or (2) the student is not dropping the course in order to withdraw from the institution. Some exemptions for good cause could allow a student to drop a course without having it counted toward this limit, but it is the responsibility of the student to establish that good cause before the drop. Students with questions should contact the Counseling Office or the Office of Admissions & Records for more information before dropping a course!

Disability Services

The goal of Disability Services is to provide students with disabilities educational opportunities equal to those of their non-disabled peers. Disability Services is located in room SC 115 in the Student Success Center.

The contact information for the Office of Disability Services is:

Jeffri Hodge

(903) 463-8751 (voice or TTY)

hodgej@grayson.edu

If you anticipate issues related to the format or requirements of this course, please meet with the Coordinator of Disability Services. The Coordinator is available to discuss ways to ensure your full participation in the course. If you determine that formal, disability-related accommodations are necessary, it is very important that you be registered with Disability Services to notify them of your eligibility for reasonable accommodations. Disability Services can then plan how best to coordinate your accommodations.

It is the student's responsibility to notify his or her professors of the need for such an accommodation. Disability Services provides students with letters to present to faculty members to verify that the student has a disability and needs accommodations. Individuals requiring special accommodation should contact the professor after class or during office hours.

Late work will not be accepted after the due date. It is the student's responsibility to ensure all work, discussions, lab performances are completed on time and given to the instructor before the due date/time. Online work will not be accepted late. Online discussions are required, dated, and timed. They will not be reopened.

Lab written performances will be completed by the student only! A student assisting another student by letting another student copy your answers violates student conduct! This is not a group discussion for answers, 98% of the answers are in your online reading or textbook

COURSE ATTENDANCE AND TARDIES

15% of a student's overall grade will be lowered once 3 absences are reached. Upon reaching the fourth absence the student overall grade will be an "F", at this point the student has missed approximately 25% or more of the course. The student will be required to retake the course.

Quizzes & Tests

There are "NO" retaking of missed exams.

Methods of Instruction

Methods of instruction include lecture, discussion, demonstration, student performance, and research.

The student is required to read online textbook assignments, perform applied arithmetic and mathematical operations, listen, participate, and write notes. Student learning increases when the student inner acts during classroom discussions.

Instructional aids include related lab equipment, presentations, transparencies, computer systems, multimedia instructional packages, and product cutaways.

Course & Instructor Policies

Students are expected to maintain classroom decorum that includes respect for other students and the instructor, prompt and regular attendance, and an attitude that seeks to take full advantage of the educational opportunity. Each student must have a current textbook or E-Book as required in the course. The classroom instructor will provide text requirements during the first class period orientation. Each student must obtain personal hand tools as required in the course. The classroom instructor will provide tool lists and obtainment dates during the first class period orientation.

Students will not be allowed to participate in lab functions without personal hand tools. Student cell phones will not be used by students during lectures, no exception! Please program all pagers and cell phones to the "silent" mode and put away during class lecture periods.

Due to the hazardous nature of your career training, safety is a priority. Horseplay and any conduct that might jeopardize your safety or others around you are prohibited. When using torches, soldering, sawing, filing, using the hammer, etc., gloves and safety glasses will be worn by the student. When using refrigerant or other pressurized substances, the student will wear safety glasses and gloves.

Grayson County College has policies governing possession and use of narcotics, alcohol and hallucinatory drugs. These policies will be strictly enforced. Non-compliance with the above-listed policies will be grounds for administrative withdrawal from the HART program.

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Responsibility for work missed because of illness or school business is placed upon the student and acceptance of late work is at the discretion of the instructor.

In accordance with the College's Developmental Education Plan, students withdrawing from their only developmental course may be withdrawn from all academic courses. In addition, students' eligibility to receive financial aid or live in a college dormitory can be

affected by withdrawal from courses. When administrative withdrawal occurs, any tuition refund would be made in accordance with state regulations. Withdrawal from Class The administration of this institution has set deadlines for withdrawal from any college-level courses. These dates and times are published in that semester's schedule of classes. Administrative procedures must be followed. It is the student's responsibility to handle student-initiated withdrawal requirements from any class. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the class once you are enrolled (see GCC College Catalog for details).

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Scholastic Dishonesty, any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give an unfair advantage to a student or the attempt to commit such acts. Plagiarism, especially from the web, from portions of papers for other classes, and from any other source is unacceptable and will be dealt with under the college's policy on plagiarism (see GCC Student Handbook for details). Grayson County College subscribes to turnitin.com, which allows faculty to search the web and identify the plagiarized material. The instructors of this department do not condone and highly discourage any of the above activities. If caught in the act, the following actions may be taken: -

- **First offense:** The removal of the assignment from the student(s) and a Zero for the assignment with no chance to make up.
- **Second offense:** The removal of the student(s) from the class with a failing grade for the course.
- **Copyright Notice** The copyright law of the United States (Title 17, United States Code) governs the making of photocopies or other reproductions of copyrighted materials, including music and software. Copying, displaying, reproducing, or distributing copyrighted works may infringe the copyright owner's rights and such infringement is subject to appropriate disciplinary action as well as criminal penalties provided by federal law. Usage of such material is only appropriate when that usage constitutes "fair use" under the Copyright Act.

COVID-19 Syllabus Information

Grayson College continues to monitor the evolving COVID-19 situation and align our college planning with guidance from the local and state health officials. Our primary goal is to protect the health and safety of our students, faculty, staff, and the Grayson community, while delivering

quality education. We will continue to communicate as more information becomes available. Safety requirements for students, faculty, staff, and the general public will be posted and kept current, so please stay tuned to your Viking email and the COVID 19 page on the Grayson College website for additional information or other changes that may be announced.

Grayson College COVID-19 Safety Protocol

The best way to prevent illness is to avoid being exposed to this virus. However, as a reminder, the Centers for Disease Control and Prevention (CDC) always recommends everyday preventive actions to help prevent the spread of respiratory diseases, including:

- Wash your hands often with soap and water for at least 20 seconds, especially after going to the bathroom; before eating; and after blowing your nose, coughing, or sneezing. If soap and water are not readily available, use an alcohol-based hand sanitizer with at least 60% alcohol.
- Always wash hands with soap and water if your hands are visibly dirty.

Information about hand-washing, see CDC's Hand-washing website.

- Avoid touching your eyes, nose, and mouth.
- Cover your cough or sneeze with a tissue, then throw the tissue in the trash.
- Avoid close contact with people who are sick.
- Stay home when you are sick.

Grayson College COVID-19 Instructional Guidelines

Grayson College continues to monitor information relating to the COVID-19 Pandemic. The College has taken steps to ensure that as many of our programs/courses can continue in the event that the College must re-institute partial and/or full campus closure to the public. Quality education will be moved to a remote delivery format, when feasible, which includes one or more of the following methods:

- Live Streaming instruction (synchronous)
- Recorded instruction (asynchronous)
- Online or web activities using the Canvas platform
- Video capture, both live and recorded sessions
- Use of open educational resources (OER) in place of traditional textbooks

Grayson College COVID-19 Lab Safety Protocol

In accordance with the Texas Department of Health and Human Services, Grayson College will

follow these guidelines:

Groups of 9 or less may be scheduled for small group labs, where hands-on skills are necessary to be practiced or demonstrated

DMW 5.5.20

Social distancing will be practiced to reduce the risk of transferring germs

Faculty and students will be screened prior to entering a lab or classroom, which will include:

- o Taking each person's temperature
- o Asking CDC-standard questions

All persons will wash hands with soap and water upon admittance

Students and faculty will participate in sanitation and cleaning of equipment and workspace at the conclusion of each session

Students are encouraged to:

- Log in to Canvas and communicate with your faculty as needed.
- Study and complete assignments in a timely manner
- Ask questions along the way

Student Responsibility

You have already made the decision to go to college; now the follow-up decisions on whether to commit to doing the work could very well determine whether you end up working at a good paying job in a field you enjoy or working at minimum wage for the rest of your life. Education involves a partnership that requires both students and instructors to do their parts. By entering into this partnership, you have a responsibility to show up for class, do the assignments and reading, be engaged and pay attention in class, follow directions, and put your best effort into it. You will get out of your experience here exactly what you put into it – nothing more and nothing less

TITLE IX

GC policy prohibits discrimination on the basis of age, ancestry, color, disability, gender identity, genetic information, national origin, race, religion, retaliation, serious medical condition, sex, sexual orientation, spousal affiliation and protected veterans status.

Furthermore, Title IX prohibits sex discrimination to include sexual misconduct: sexual violence (sexual assault, rape), sexual harassment and retaliation.

For more information on Title IX, please contact:

- Molly M. Harris, Title IX Coordinator (903)463-8714
- Logan Maxwell, Title IX Deputy Coordinator - South Campus (903) 415-2646
- Mike McBrayer, Title IX Deputy Coordinator - Main Campus (903) 463-8753

- Website: <http://www.grayson.edu/campus-life/campus-police/> (Links to an external site.)title (Links to an external site.)- (Links to an external site.)ix (Links to an external site.)-policies.html (Links to an external site.)
- GC Police Department: (903) 463-8777- Main Campus) (903-415-2501 - South Campus)
- GC Counseling Center: (903) 463-8730
- For Any On-campus Emergencies: 911

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Grayson College campus-wide student policies may be found on our Current Student Page on our website: <http://grayson.edu/current-students/index.html> (Links to an external site.)

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Grayson County College is not responsible for illness/injury that occurs during the normal course of classroom/lab/clinical experiences. These descriptions and timelines are subject to change at the discretion of the Professor.

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website: <https://www.grayson.edu/currentstudents/Academic%20Resources/index.html>

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Furthermore, Title IX prohibits sex discrimination to include sexual misconduct: sexual violence (sexual assault, rape), sexual harassment and retaliation.

For more information on Title IX, please contact:

Dr. Regina Organ, Title IX Coordinator (903-463-8714)

Mr. Brad Bankhead, Title IX Deputy Coordinator- South Campus (903) 415-2601

Mr. Mike McBrayer, Title IX Deputy Coordinator (903) 463-8753

Website: <http://www.grayson.edu/campus-life/campus-police/title-ix-policies.html> (Links to an external site.)

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