

**NORTHEAST COMMUNITY COLLEGE
COURSE SYLLABUS**

**HVAC 2230
PHYSICS OF BUILDING SCIENCE**

FALL 2015

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PHYSICS OF BUILDING SCIENCE
COURSE SYLLABUS**

I. CATALOG DESCRIPTION:

COURSE NUMBER: HVAC 2230

COURSE TITLE: Physics of Building Science

PRE-REQUISITES: None

CO-REQUISITES: None

DESCRIPTION: This course teaches you basic principles of building science to assess energy efficiency in a home while also monitoring conditions that have a direct impact on human health and safety. Students will learn how to perform calculations to meet ventilation requirements and determine thermal efficiency. You will also learn how to use diagnostic equipment to ensure systems are functioning together correctly to maximize home performance, comfort, energy efficiency, safety, and durability.

CREDIT/CONTACT HOUR DESIGNATION:

Credits: 2 Lecture: 30 Lab: 0 Clinical: 0 Coop: 0

TERM: Fall 2015

II. COURSE OBJECTIVES:

Course will:

1. Analyze the fundamentals of building envelope and the house as a system.
2. Explain the study of psychrometrics.
3. Identify the principles of energy.
4. Perform tests to identify ventilation requirements.
5. Calculate Area, Volume, and CFM. *
6. Identify the basic energy systems that impact a home's energy consumption and durability.
7. Identify common building envelope problems that reduce efficiency, air quality, comfort, and occupant health & safety.
8. Explain carbon monoxide and potential dangers in combustion appliances.
9. Explain multiple air distribution systems.
10. Discuss types of heat transfer.*
11. Determine R-Value and U-Value of construction materials to calculate heat loss and heat gain.*
12. Recognize causes of pressure differences and stack effect in buildings.

13. Determine and explain the thermal and pressure boundary with reference to inside and outside of structure.*
14. Demonstrate infrared thermography and thermal imaging to reveal thermal patterns and air leakage in homes and buildings.
15. Identify the types of moisture intrusion and causes.

* Course objectives address goals established for the Fundamental Academic Competencies and Skills (FACS) in communication, social and cultural awareness, and critical thinking/problem solving.

III. STUDENT LEARNING OUTCOMES:

The student will be able to:

1. Explain the home as a system and impacts of each component.
2. Identify the basic ways moisture is introduced.
3. Explain forces that effect airflow.
4. Explain how to control heat transfer.
5. Identify the importance of controlling fresh air and ventilation efficiently.
6. Plot dew point and relative humidity on psychrometric charts.
7. Explain thermal dynamics and how it relates to building science.
8. Explain blower door test and calculate ventilation requirements.
9. Calculate building square feet, cubic volume, kilowatt Hours, BTU and efficiency.
10. Explain types of energy used for building comfort and sustainability.
11. Determine energy consumption calculation descriptions using HSPF, SEER, AFUE, COP and EER.
12. Explain testing procedures for gas leaks with combustible leak detector.
13. Determine how to measure carbon monoxide levels in combustible appliances.
14. Identify heat transfer using thermal imaging technology.
15. Describe how to find common pressure differences in homes and determine ways to minimize it.

IV. CONTENT/TOPICAL OUTLINE:

- A. Principles of Energy
- B. Basics of Heat
- C. Basics of Moisture
- D. Basics of Airflow
- E. Building Structural Elements
- F. Insulation
- G. Building Mechanical Systems
- H. Blower Door and Pressure Diagnostics
- I. Combustion Testing
- J. Health and Safety

V. INSTRUCTIONAL MATERIALS:

A. Required Text:

1. Building Science Professional review handout

VI. METHOD OF PRESENTATION:

A. Methods of presentation typically include a combination of the following:

1. Handouts of all printed material covered in class.
2. Audiovisual aids (smart board and videos)
3. Independent study (reading of handouts, text, and preparing for tests).
4. Informal lectures (casual communication of knowledge).
5. Demonstrations (the use of testing equipment).

VII. METHOD OF EVALUATION:

A. Methods of evaluation typically include a combination of the following:

1. Written tests 60%
2. Quizzes 40%
3. Student evaluation is done through completed assignments, quizzes, and tests.
4. Jupiter Grades will be used to view assignments and grades.

B. Grading Scale:

95 - 100	A+
90 - 94	A
85 - 89	B+
80 - 84	B
75 - 79	C+
70 - 74	C
65 - 69	D+
60 - 64	D
Below 60	F

VIII. COURSE REQUIREMENTS:

A. Attendance

1. Students are expected to attend class. Quizzes will be given and cannot be made up unless approval from instructor. If you cannot attend class, see or call instructor (phone number 402-844-7230). Your grade will start dropping by a letter grade for each day after three days.

B. Student Conduct

1. Students are expected to complete your own work. Students will also be expected to conform to the Student Code of Conduct that was handed out.

IX. SUPPORT SERVICES:

A. **Disabilities:**

Students with a documented disability may be eligible for certain accommodations that support their success in the classroom. Please contact Mary Balaski, Disability

Services Coordinator, for further information. Her office is located in CWC- 1263; also, she may be reached at 402-844-7343 or mary@northeast.edu.

B. Service Center:

Students may get assistance with computer-related problems through the College's Service Center; help@northeast.edu. It is strongly advised that a student participate in on-line training via a formal course or the on-line tutorials available through Northeast Community College's homepage; <http://northeast.edu/help/>

Email: help@northeast.edu

Phone number: 402-844-HELP (4357)

In person: The Service Center is located in the Library on the Norfolk campus

Service Center Hours of Operation:

Sunday 1:00 p.m. - 9:00 p.m.

Monday - Thursday 7:00 a.m. to 10:00 p.m.

Friday 7:00 a.m. to 5:00 p.m.

If you have technical questions regarding the My Classes Online environment you need to contact the Service Center. Questions regarding the course content need to be directed to the instructor via My Classes Online Course Mail (email).

C. Advising & Academic Support Center (CWC 1284)

This is a one stop shop for all students. Advisors are available to assist with schedules, career planning, transfer questions, change of majors, academic recovery and other issues impacting academic success. Located in CWC 1284, students will find a study space, lounge area and computers. Direct contact information is as follows:

Amanda Engelhart – 402.844.7125 or amandae@northeast.edu

1. Tutoring – CWC 1284
2. Writer's Clinic – CWC 1284

D. Library Service:

The Northeast Community College Library Resource Center provides students with tools to conduct scholarly research and increase knowledge. Through the library's subscription databases, students have access to millions of current and credible resources not available through Google, Yahoo, and other search engines. Links to online databases and the library's online catalog can be found at <http://www.northeast.edu/Library-Resources/>. Students who would like assistance in utilizing the library's resources are encouraged to contact the library for further information and personal service at 402-844-7131 or email marylouise@northeast.edu.

E. Title IX:

While I want you to feel comfortable coming to me with issues you may be struggling with or concerns you may be having, please be aware that I have reporting requirements that are part of my job requirements at Northeast Community College.

For example, if you inform me of an issue of sexual harassment, sexual assault, or discrimination I will keep the information as private as I can, but I am required to bring it to the attention of the institution's Title IX Coordinator. The Associate Vice President of Human Resources is the Title IX Coordinator and can be reached by calling 402-844-7046. You could also call the Vice President of Student Services at 402-844-7273. Additionally, you can report incidents or complaints to the Dean of Student Life by calling 402-844-7722.

Another common example is if you are struggling with an issue that may be traumatic or unusually stress producing, I will likely inform the Northeast Counseling Services office. If you would like to reach out directly to the Counseling Office, the contact number is 402-844-7277.

Finally, know that if, for some reason, our interaction involves a disruptive behavior or potential violation of policy, I will inform the Director of Student Conduct office even when you and I may have reached a resolution to the incident. The purpose of this is to keep the Director apprised of any concerning behaviors and what was done to resolve them.

F. Applied Technology Division Safety Statement

Through the course of the semester you will be working with and around equipment that can be dangerous. The inherent dangers include both kinetic and potential energy; examples include, but are not limited to, high voltages, rotating equipment, high pressure hydraulics, compressed air, items that are heavy and/or hot, and the risk of fall or shock. Every effort has been made to minimize these risks and you will receive instruction and training as a part of this course (and related courses) in the proper safety procedures and equipment operation protocols. If you have a health condition or physical limitation that may affect you or another student's safety, you are to consult with the instructor prior to beginning to work with the equipment or undertaking a task involving the equipment. It is the student's responsibility to be able to follow all safety procedures and equipment operation protocols. Failure to abide by safety practices, procedures, or equipment protocols could result in serious injury or death. Failure to follow these safety practices / procedures or equipment protocols will not be tolerated and the student could face student disciplinary action including reduction of grade and possible removal from the course. Removal from the course could also result in loss of credit for the course and affect a student's financial aid.

X. INSTRUCTOR NAME AND CONTACT INFORMATION:

Instructor: Mr. Paul Bailey

Office: APT 145

Office Phone: 402-844-7230

Home Phone: 402-371-0394 (after 5:00pm)

Email: paulb@northeast.edu

Office Hours: Tuesday and Thursday 3:00PM – 4:00PM
Monday & Wednesday 4:00PM – 5:00PM



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