

**NEOSHO COUNTY COMMUNITY COLLEGE  
MASTER COURSE SYLLABUS**

**COURSE IDENTIFICATION**

Course Code/Number: ENRG 200

**Course Title:** Manufactured Housing Audits

Division:  Applied Science (AS)  Liberal Arts (LA)  Workforce Development (WD)  
 Health Care (HC)  Lifetime Learning (LL)  Nursing  Developmental

Credit Hour(s): One (1)

Effective Date: Fall2013

Assessment Goal Per Outcome: 70%

**COURSE DESCRIPTION**

This course defines the need for energy management as an integral part of society at all levels. This course continues to teach energy auditing techniques for the Manufactured Housing Training. Hands-on applications of energy auditing techniques, and use of required equipment will be taught. Students will leave with a thorough understanding of methods, processes, and procedures of auditing energy use/consumption and will be assessed to BPI (Building Performance Institute) Manufactured Housing Analyst Standards and Certification.

Topics include: Health and Safety, Duct Systems, Blower Door operation, air quality, Pressure Balance Procedures, Belly Inspection and Repair, Belly Insulation Procedures, Wall Insulation, Roof Insulation, Infiltration and Ventilation, Mechanical Systems, Windows, Doors, Moisture control, plus many other topics associated with manufactured housing.

**MINIMUM REQUIREMENTS/PREREQUISITES AND/OR COREQUISITES**

CSIS 100 Computer Concepts and Application; 3 credit hours or test out; or permission of instructor.

Each student will be required to have passed the Building Analyst Course (ENRG 100) and be BPI certified.

## TEXTS

The official list of textbooks and materials for this course is found on [myNeosho](http://www.neosho.edu/ProspectiveStudents/Registration/CourseSyllabi.aspx).

<http://www.neosho.edu/ProspectiveStudents/Registration/CourseSyllabi.aspx>

## GENERAL EDUCATION OUTCOMES

1. Practice Responsible Citizenship through:
  - identifying rights and responsibilities of citizenship,
  - identifying how human values and perceptions affect and are affected by social diversity,
  - identifying and interpreting artistic expression.
2. Live a healthy lifestyle (physical, intellectual, social) through:
  - listing factors associated with a healthy lifestyle and lifetime fitness,
  - identifying the importance of lifetime learning,
  - demonstrating self-discipline, respect for others, and the ability to work collaboratively as a team.
3. Communicate effectively through:
  - developing effective written communication skills,
  - developing effective oral communication and listening skills.
4. Think analytically through:
  - utilizing quantitative information in problem solving,
  - utilizing the principles of systematic inquiry,
  - utilizing various information resources including technology for research and data collection.

## COURSE OUTCOMES/COMPETENCIES (as Required)

Upon the successful completion of the course, the student should be able to:

1. Demonstrate the ability to develop an energy plan for a Manufactured home.
  - Identify and explain/defend possible energy inefficiencies in a residential home
  - Discuss how to remedy energy loss in a home
  - Identify and demonstrate different ways to gain/retrofit energy savings
  - Complete an energy plan for a pre-selected home
  - Analyze the building envelope
  - Accurately calculate a buildings volume and area
  - Accurately calculate, determine and explain a buildings minimum air-flow need
  - Accurately measure and determine envelope air quality safety standards
  - Perform combustion safety test and determine/defend acceptable ranges
  - Inspect and determine/defend inspection of ducting system
  - Demonstrate proper use of related analysis-testing equipment
  - Accurately perform, calculate and determine/defend air leakage inspection
  - Demonstrate ability to inspect, analyze and explain/defend a general manufactured home investigation
  - Accurately perform, analyze and determine/defend results on a domestic hot water heater

inspection

- Accurately measure, calculate and explain/defend combustion appliance acceptable draft ranges
- Demonstrate by testing or recommend/defend pressure differential diagnostics

2. Demonstrate the ability to use energy saving materials.

- Explain and demonstrate how to find and recommend proper sealing of air leaks
- Analyze and identify different types of insulation materials and accurately calculate R-factor ratings
- Analyze and discuss/defend different types of energy efficient doors and windows
- Accurately calculate window U-values
- Accurately calculate and convert R-values to U-values and vice versa
- Identify and explain significant lighting upgrade opportunities
- Identify and explain major electric appliance upgrade opportunities
- Identify and explain important fuel-switching opportunities
- Demonstrate the ability to diagnose and explain/defend heat loss/gain
- Demonstrate use of a blower door
- Perform an accurate blower door test
- Explain the purpose of a blower door test

3. Demonstrate an understanding heating and cooling systems.

- Explain and identify different types of heating systems and their energy efficiency
- Explain and identify different types of cooling systems and their energy efficiency
- Explain and identify different types of DHW (domestic hot water heater) systems and their energy efficiency
- Demonstrate how to size heating and cooling systems for a manufactured home
- Analyze and discuss moisture management and ventilation
- Identify and determine heating/cooling duct performance and insulating requirements

4. Demonstrate an understanding of the energy saving aspects of a new manufactured home.

- Discuss why to implement energy efficient techniques in a new manufactured home
- Analyze different types of energy efficient building techniques
- Analyze, explain and recommend advanced energy systems such as solar, wind, geothermal, and photovoltaic as needed
- Demonstrate an understanding of building science including the basic physics of a house.

5. Demonstrate the ability to diagnose the overall IAQ (indoor air quality), health and safety of residential buildings.

- Perform and determine/defend envelope CO testing
- Identify, explain and demonstrate the importance and techniques of interior moisture control
- Discuss importance of repair and installation of energy saving appliances and HVAC systems
- Demonstrate how to test for combustion with interior appliances

6. Demonstrate the ability to analyze data and make sound conclusions and recommendations for energy efficiency and energy cost savings.

- Demonstrate the ability to evaluate energy use patterns and measure costs associated with energy usage.

- Demonstrate the ability to utilize computerized home energy efficiency modeling software

## MINIMUM COURSE CONTENT

The following topics must be included in this course. Additional topics may also be included.

### Segment 1: CLASSROOM

#### Introduction

Why is a manufactured home audited different from a traditional home?

#### Section 2

##### Health and Safety

Inspect wiring and correctly identify type

Discuss electrical inspection for operation of outlets, lights

Inspect plumbing for leaks, specifying repairs

Discuss scaffolding set up

Discuss proper use of PPE

Specify appropriate installation of carbon monoxide detector

Inspect for moisture issues in the interior walls and roof cavities

Identified sources of moisture and specific treatment

Demonstrate CO testing for oven/range

#### Section 3

##### Belly

Complete thorough inspection of belly board, vapor barrier, insulation, duct work, frame type

Identify and prioritize belly treatment including interior as needed

Identify proper materials and procedures for treatment (dense pack wings (rim joist) prioritize belly patches over insulation

Explain procedures for insulating with both longitudinal and cross framing

#### Section 4

##### Sidewalls

Identify construction type, including interior obstructions

Identify existing insulation

Discuss proper procedures for drilling, opening and plugging/sealing holes after installation

Discuss proper tubing technique for blowing fiberglass

Discuss wall stuffing technique

#### Section 5

##### Windows and Doors

Inspect for proper fit, operation and performance

Identify appropriate replacement if needed

Discuss procedure to accurately measure for replacement

#### Section 6

##### Roof/Ceiling

Discuss roof inspection and how to gain access

Identify framing type and condition of roof/ceiling  
Identify type, location and effectiveness of insulation and vapor barrier  
Inspect for proper terminations of plumbing, flues, ventilation and wiring  
Discuss procedures for blocking around and sealing large penetrations  
Identify strong back members and procedures for getting around them

#### Section 7

##### Air Sealing/Ventilation

Discuss procedure to prepare MH for blower test  
Prioritize insulation/air sealing measures based on BD results  
Understand and demonstrate blower door operation and testing procedure

#### Section 8

##### Mechanical Systems

Identify venting type of furnace and recommendations  
Identify type of DHW  
Inspect DHW for switchable gas valve  
Identify other potential problems in DHW closet area  
Demonstrate pressure differential test to verify separation of closet from living space and furnace  
Demonstrate Carbon Monoxide testing procedure for furnace and DHW  
Discuss pipe insulation for water heaters or piping as needed  
Discuss CAZ depressurization test, calculate make up air and inspect for code violations

#### Section 9

##### Ductwork

Demonstrate proper inspection techniques  
Demonstrate pressure pan test and properly interpret results  
Identify areas for treatment  
Identify proper materials and procedures for treatment  
Demonstrate room to room pressure testing  
Identify treatments to relieve pressure imbalances between rooms

#### Section 10

Review test  
Review 25 question test to be turned in on day 2, this test grade will count as your classroom attendance grade

#### Segment 2:

Section 1 9 a.m. - Noon - Hands on Field instruction applying information from day 1

Section 2 1 p.m. - 2:30 p.m. Review for BPI 1 ½ hour, 50 question written test. (this test must be passed to continue to the field audit test)

Section 3 3 p.m. - 4:30 p.m. Online written BPI test.

#### Segment 3:

2 hour field audits start a 9am and continue every 2 hours may possibly run into day four if there are more than 5 students

## **STUDENT REQUIREMENTS AND METHOD OF EVALUATION**

### INSTRUCTIONAL METHODS

1. Lecture
2. Audio-Visual aids
3. Example and demonstration
4. Class discussions & participation
5. Hands-on use of auditing equipment
6. Individual actual audit performance
7. Tests (written) and online
8. Skills tests (performance-based)

### STUDENT REQUIREMENTS

Laptop computer – suggested system requirements:

OS: Windows 98, Windows ME, Windows 2000, Windows XP, Windows Vista

CPU: 200 MHz or better

RAM: 64 MB or better

Disk: 20 MB or better free disk space

Other: CD-ROM Drive for software installation

Scientific calculator (non-graphing types)

Highlighter pen

Evaluation of student performance is determined primarily from results of written tests to validate mastery of course competencies.

### GRADING SCALE

90-100 %	A
80-89 %	B
70-79 %	C
60-69 %	D
0-59 %	F

### CERTIFICATES

Upon successful completion of course requirements and assessments a certificate will be issued. This “single” certificate will acknowledge course content completion with NCCC.

### BPI CERTIFICATION

BPI certification is an integral component of the Energy Auditor course! Pursuit of a BPI “Manufactured Home” certification requires students to have successfully met or exceeded course candidate status requirements. With course requirements met students will then enter into BPI “candidate status” to attempt and perform assessment requirements for the BPI Manufactured Home certification. Criteria for students to successfully meet for BPI candidate status are as follows:

- 100% attendance of entire course content
- Completion of worksheets with a passing score of 70% or higher
- 70% score or higher on course written exam

Once in “candidate status” students can then attempt to work towards earning a BPI Manufactured Home certification, which is a “national certification” for Building Performance Institute by meeting or exceeding specific knowledge and performance criteria to BPI “Manufactured Home” standards.

BPI “MH” certification is predicated on the successful completion of two comprehensive examinations. One exam is dependant of the other – the written exam must be attempted first and successfully passed before a candidate can attempt the hands on field performance exam – The field performance exam cannot be attempted if the written exam is not passed! BPI manufactured home certification requires the following criterions to be met:

BPI Written Exam:

- 70% or higher score on BPI written exam [to administered via online at a pc workstation and scored by BPI] [Students will receive immediate scoring feedback upon completion of the written exam]

BPI Field (hands-on) Performance Exam:

- 70% or higher “OVERALL” score on BPI manufactured home exam [individual hands on performance assessment][Exam is scored by BPI, there are critical sections that require higher scoring as opposed to other sections within the field performance exam]
- Official final field performance score results will come from BPI via a written letter and score sheet within four to six weeks post exam completion.

### Unsuccessful BPI exam completion

Students unsuccessfully meeting BPI exam criterion can retake, at the instructors discretion either exam or whichever is needed (written [taken 1st] and/or field practicum) must wait 30 days or longer before re-attempting the unsuccessful exam.

Exam retakes require additional fees to be paid prior to the reattempt. BPI exam fees can be addressed in the NCCC Outreach and Workforce Development offices.

Only one reattempt of either exam is possible, if unsuccessful the energy auditor course will have to be retaken before attempting exams once a recommended 60 day time frame has passed.

For BPI exam reattempts - Student must attend at least the final two days of the course curriculum for home and auditor diagnostic tool re-acclimation!

### **ASSESSMENT OF STUDENT GAIN**

Students will be assessed through written testing and assignments. Comparison will determine the extent of student gain.

## **Attendance Policy**

1. NCCC values interactive learning which promotes student engagement in the learning process. To be actively engaged, the student must be present in the learning environment.
2. Unless students are participating in a school activity or are excused by the instructor, they are expected to attend class. If a student's absences exceed one-eighth of the total course duration, (which equates to one hundred (100) minutes per credit hour in a face-to-face class) the instructor has the right, but is not required, to withdraw a student from the course. Once the student has been dropped for excessive absences, the registrar's office will send a letter to the student, stating that he or she has been dropped. A student may petition the chief academic officer for reinstatement by submitting a letter stating valid reasons for the absences within one week of the registrar's notification. If the student is reinstated into the class, the instructor and the registrar will be notified. Please refer to the Student Handbook/Academic Policies for more information
3. Absences that occur due to students participating in official college activities are excused except in those cases where outside bodies, such as the State Board of Nursing, have requirements for minimum class minutes for each student. Students who are excused will be given reasonable opportunity to make up any missed work or receive substitute assignments from the instructor and should not be penalized for the absence. Proper procedure should be followed in notifying faculty in advance of the student's planned participation in the event. Ultimately it is the student's responsibility to notify the instructor in advance of the planned absence.

## **ACADEMIC INTEGRITY**

NCCC expects every student to demonstrate ethical behavior with regard to academic pursuits. Academic integrity in coursework is a specific requirement. Definitions, examples, and possible consequences for violations of Academic Integrity, as well as the appeals process, can be found in the College Catalog, Student Handbook, and/or Code of Student Conduct and Discipline.

## **ELECTRONIC DEVICE POLICY**

Student cell phones and other personal electronic devices not being used for class activities must not be accessed during class times unless the instructor chooses to waive this policy.

## **NOTE**

Information and statements in this document are subject to change at the discretion of NCCC. Students will be notified of changes and where to find the most current approved documents.

## **ACCOMMODATIONS**



If you are a student with a disability who may need accommodation(s), in compliance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act (ADA) of 1990, please notify the Dean of Student Services in the Student Services Office, Sanders Hall, 620-432-0304, on the Chanute Campus, or the Dean for the Ottawa and Online Campuses, 785-248-2798, on the Ottawa Campus as soon as possible. You will need to bring your documentation for review in order to determine reasonable accommodations, and then we can assist you in arranging any necessary accommodations.

## **NON-DISCRIMINATION POLICY**

The following link provides information related to the non-discrimination policy of NCCC, including persons with disabilities. Students are urged to review this policy.

<http://www.neosho.edu/Departments/NonDiscrimination.aspx>

## **SEXUAL MISCONDUCT POLICY (TITLE IX)**

At NCCC, it is the responsibility of an instructor to help create a safe learning environment in the classroom, including both physical and virtual classrooms. All instructors are considered mandatory reporters at NCCC, therefore any information regarding sexual misconduct that is shared by a student in one-on-one meetings with the instructor must be reported to appropriate personnel at the College. Instructors will keep the information private to the greatest extent possible, but it is not confidential. Generally, climate surveys, classroom writing assignments or discussions, human subjects research, or events such as Take Back the Night events do not provide notice that must be reported to the Coordinator by employees, unless the reporting party clearly indicates that they wish a report to be made.

The following link provides information related to the sexual misconduct policy of NCCC, including resources, reporting options, and student rights. Students are urged to review this policy.

<http://www.neosho.edu/TitleIX.aspx>

## **COURSE NOTES**