

**NEOSHO COUNTY COMMUNITY COLLEGE
MASTER COURSE SYLLABUS**

COURSE IDENTIFICATION

Course Code/Number: ENRG 101

Course Title: Energy Auditor- Building Analyst

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

Credit Hour(s): Three (3)

Effective Date: Fall 2013

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 teaches energy auditing techniques for the residential setting. Hands-on applications of energy auditing techniques, required equipment and auditing software 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) Building Analyst Standards and Certification.

MINIMUM REQUIREMENTS/PREREQUISITES AND/OR COREQUISITES

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

TEXTS

The official list of textbooks and materials for this course is found on [myNeosho](#).

<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)

1. Demonstrate the ability to develop an energy plan for a 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 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
 - Identity 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 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 building a new home.
- Discuss why to implement energy efficient techniques in a new 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 associates with energy usage.
 - Demonstrate the ability to utilize computerized home energy efficiency modeling software

MINIMUM COURSE CONTENT

Each segment begins at 9 am and runs to 5pm

Segment 1: CLASSROOM

Introduction

What is BPI?

Introduction to REM Design

Section 2

Building Science Basics

Construction
Geometry – the basics
Calculating conversions

Energy Basics

Source comparisons
Laws of Thermodynamics
Energy and Power
Watts and Ohms Laws
Energy units

Regional Heating/Cooling

CDD/HDD calculations
Balance points

Potential Energy Conservation

Cost effectiveness of retrofits

Section 2 quiz

Section 3 Audit exterior Walk-Through

Building Inspection
Framing
Points of Weakness
Thermal Boundary

Building-Shell Inspection and Diagnosis

Building Diagnostic Procedures
Heat Flow
Calculating heat flows
Calculating heat load
Calculating heat loss

Section 3.a quiz

Section 3 Audit Exterior Walk-through

Window characteristics

Fenestration

Window/door characteristics

Window structure
Glass characteristics
Solar and Optical characteristics
Condensation
RH –Relative Humidity
Window treatments
Window U-values
Window replacement

Doors

Door types
Storm doors
Door Weather-Stripping

Section 3.b quiz

Section 3 (cont.) Air leakages

- Air Sealing Principle
- Measuring Devices
- Blower Door Testing
- Measurement types
- BAS (Building Air-flow Standard)
- N-factors
- Finding Air Leaks
- Construction Flaws and Air Leakage
- Air-Sealing Methods and Materials
- Section 3.c quiz

Segment 2: CLASSROOM

Section 4 Audit Interior walk-through

- Insulation Characteristics
- Insulation Thermal Performance Factors
- Insulation Types
 - Fiberglass insulation
 - Blown insulation
 - Plastic foam panels
 - Foam insulation
- Where to insulate
- Sprayed and Injected Insulation
- Basement and Floor Insulation
- Duct Sealing Insulation
- Facings and Barriers
- Weather Resistant Barriers
 - Air barriers
 - Vapor barriers
- Fire barriers
- Retro-fitting insulation
- Insulation in new construction
- Section 4.a quiz

Section 4.b Lighting Basics

- Types of Lighting
- Lighting Energy Efficiency
 - Potential savings
- Appliances
 - Electrical appliances
 - Laundry appliances
 - Appliances Peak demand
- Section 4.b quiz

Section 5 Audit Systems walk-through

- Heating Systems
 - Heating comfort controls
- Distribution Systems
- Electric heat

Combustion Room Heaters
Hot-Water & Steam-Heating Systems
New energy efficient combustion furnaces and update opportunities
Section 5.a quiz

Section 5.b Cooling Systems

How cooling is different than heating
Summer comfort principles
Cooling and ventilation
Air movement
Evaporative coolers
Air conditioners
Section 5.b quiz

Section 5.c Water Heating

Storage water heaters
Alternatives to storage water heaters
Increasing water-heating efficiency
Maintenance and Operation
Section 5.c quiz

Section 6 Health and Safety

Whole-house mechanical ventilation
Moisture management
Indoor pollutants
Air conditioners and Dehumidifiers
Pollutant control strategies
Section 6 quiz

Section 7 Assessment Process

Process
Process outline
Pre-audit
Utility bills
Exterior inspection
Interior inspection
Systems inspection –
Domestic hot-water heater
Heating
DHW testing
Combustion testing
Thermal inspection
Section 7.a quiz
Exam taking tips

Segment 3: FIELD TRAINING

AM - Two groups – 1- Exterior

Exterior audit process
Insulation
Doors and Windows

Work scope
Drawings
Data collection

2 – Interior

Interior audit process
Work scope
Data collection
Tool demonstrations
Introduction to Blower Door
Blower Door Test
Pressure Diagnostics

Groups swap training environments

PM – complete audit demonstration

Measurement tool operation by students - familiarization

Segment 4: FIELD TRAINING

Heating
Cooling
Water Heating
Furnace Inspection
Moisture
Combustion
Field Data Collection

Segment 5: COMPUTER LAB

8 AM - Review for BPI Online Written Examination

9 AM – 11 AM - BPI Online Written Examination 2-hour timed exam

12:15 PM to 5 PM - REM-Design Training

NOTE – LAPTOP COMPUTER REQUIRED

Segment 6 & 7: BPI - FIELD TESTING (begins at 8 am) [may be extended to a third day]

Individual 2 hour increment Performance Tests

STUDENT REQUIREMENTS AND METHOD OF EVALUATION

INSTRUCTIONAL METHODS

1. Lecture
2. Audio-Visual aids
3. Example and demonstration
4. Lab practice
5. Class discussions
6. Field trips and guest speakers
7. Tests (written)
8. Skills tests (performance-based)

STUDENT REQUIREMENTS

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 along with a qualifications acknowledgement for successfully meeting REM/Design training requirements. The REM certification will be omitted for unsuccessful completion of REM training requirements.

BPI CERTIFICATION

BPI certification is an integral component of the Energy Auditor course! Pursuit of a BPI “Building Analyst” 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 building analyst 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 80% or higher
- 80% score or higher on course written exam

Once in “candidate status” students can then attempt to work towards earning a BPI Building Analyst (energy auditor) certification, which is a “national certification” for Building Analyst by meeting or exceeding specific knowledge and performance criteria to BPI “BA certificate” standards.

BPI “BA” 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 building analyst certification requires the following criteria 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 along with an 85% score or higher in both the CAZ (combustion appliance zone) and CO (nauseous gas) sections** on BPI field performance 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

The purpose of assessing student learning at Neosho County Community College is to ensure the educational purposes of the institution are met and appropriate changes are made in program development and classroom instruction to allow for student success.

Students will be assessed through written testing. 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