A. K. Smith Area Career Center

La Porte County Career and Technical Education

Course Syllabus

Electrical; Level One – Level Two; 1st and 2nd Semester

School Year 2015-2016

Course Title: Electrical; Level One, Year Two – 1st Semester

Times: Monday through Friday

A.M. Session: 7:25AM – 9:45AM

P.M. Session: 11:35AM – 2:00PM

Office Hours: 10:30AM – 11:30AM

Instructor: **Craig Lindgren** (Indiana Professional Educators License)

(NCCER Certified)

(PLTW Certified)

(OSHA 10 Certified)

(CompTIA 'A+' Certified Professional)

Room 202

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Prerequisites: Core Curriculum, Introduction to Craft Skills

NCCER: The National Center for Construction Education and Research (NCCER) is a not-for-profit educational foundation established in 1995 by the world's largest and most progressive construction companies and national construction associations. It was founded to address the severe workforce shortage facing the industry and to develop a standardized training process and curricula. NCCER also maintains a National Registry that provides transcripts, certificates, and wallet cards to individuals who have successfully completed modules of NCCER Contren Learning Series. Training programs must be delivered by an NCCER Accredited Training Sponsor.

Dual Credit: Dual credit courses are college based courses taken in high school for which the student earns both high school and college credit at the same time.

Text Book: Core Curriculum: Introductory Craft Skills NCCER Learning Series – Prentice Hall

Materials: Trainees must have a binder specifically for this class, that will include notebook paper, pencils, and a calculator (an ink pen is optional).

Cell Phone, MP3 Player, and Electronic Device Policy:

The MCAS policy is in effect at A. K. Smith Area Career Center. No phone calls or texting is allowed in the classroom. Cell phones will be asked for and turned in to the office.

Required Uniform: Trainees will wear short or long sleeve collared shirts, preferable cotton, solid colors of blue, grey, black, khaki, or white. Sweaters solid colors see above. Khaki or blue cotton pants or blue jeans are to be worn. (Note: No 'T' shirts, shorts, jackets, hoodies, coats, sandals, or warm up athletic clothes. All clothes are to be clean and hole free. Pants are to be worn at the waist, with a belt. Students will wear boots that cover the ankle (i.e. at least 6" high). Students may wear tennis shoes on lecture days, boots should be in the locker when not worn.

Grading: The MCAS grading scale will be used.

90% – 100% = A

80% – 89% = B

70% – 79% = C

60% – 69% = D

59% and lower is an F

All Math related assignments, quizzes, and tests will be completed in pencil and all work must be shown.

On all 'Electrical Level One' Tests the trainee must pass with a 70% or higher. A trainee will have three attempts to pass the test with review. Trainee's that cannot pass an 'Electrical Level One' Test within three (3) tries will be dropped from the class.

Course Outline:

I. Orientation to the Electrical Trade

A. Introduction

B. Career Opportunities in the Electrical Field

C. Your Training Program

D. Responsibilities of the Employee

E. Responsibilities of the Employer

F. Safety

G. Review and Testing

1. Review materials

2. Module Examination; Trainee must score 70 percent or higher to receive recognition from NCCER and course credit.

II. Electrical Safety

A. Introduction to Electrical Hazards
1. Introduction
2. Electrical shock
3. Protective Equipment
4. OSHA
5. NFPA 70E

B. Ladders, Lifts, and Lifting

1. Ladders and Scaffolds

2. Lifts, Hoists, and Cranes

3. Lifting

4. Basic Tool Safety

C. General Construction Safety Topics
1. Confined Space entry Procedures
2. First Aid
3. Solvents and Toxic Vapors
4. Asbestos, Batteries, PCBs, and Vapor Lamps

D. Lead Safety; Fall Protection; hazard Assessment; Review and Testing

1. Lead Safety
2. Fall Protection
3. Hazard Protection
4. Review and Testing

A. Review materials

B. Module Examination; Trainee must score 70 percent or higher to receive recognition from NCCER and course credit.

C. Performance Testing; Trainee must perform each task to the satisfaction of the instructor to receive recognition from NCCER. Proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.

III. Introduction to Electrical Circuits

A. Introduction to Electrical Theory
   1. Atomic Theory
   2. Electrical Power Generation and Distribution
   3. Electric Charge and Current

B. Ohm's Law; Schematics; Measurements
   1. Ohm's Law
   2. Schematic Representation of Circuit Elements
   3. Resistors
   4. Electrical Circuits
   5. Electrical Measuring Instruments

C. Power Equations; Review and Testing
   1. Electrical Power
   2. Review and Testing

A. Review materials

B. Module Examination; Trainee must score 70 percent or higher to receive recognition from NCCER and course credit.

IV. Electrical Theory

A. Introduction to Resistive Circuits
    1. Resistance in Series
    2. Resistance in Parallel
    3. Series-Parallel Circuits

B. Applying Ohm's Law to Resistive Circuits
    1. Voltage and Current in Series Circuits
    2. Voltage and Current in Parallel Circuits
    3. Voltage and Current in Series-Parallel

C. Power Tools Part Three
    1. Grinders, Sanders, Pneumatically Powered Nailers, Powder-Actuated Fastening Systems, Air Impact Wrench, Pavement Breaker, and Hydraulic Jack

D. Review and Testing
    1. Review materials
    2. Module Examination; Trainee must score 70 percent or higher to receive recognition from NCCER and course credit.

V. Introduction to the National Electrical Code (NEC)

A. Introduction to the NEC
    1. Introduction
    2. Purpose and History of the NEC
    3. The Layout of the NEC

B. Navigating the NEC, Part One
    1. Chapter #1 – General
    2. Chapter #2 – Wiring and Protection
    3. Chapter #3 – Wiring Methods and Materials
    4. Chapter #4 – Equipment and General Use
    5. Chapter #5 – Special Occupancies
    6. Chapters 6, 7, and 8 – Special Equipment, Special Conditions, and Communications Systems

C. Navigating the NEC, Part Two; Review and Testing

1. Scale
2. Lines of Construction
3. Abbreviations, Symbols, and Keynotes
4. Using Gridlines to Identify Plan Locations
5. Dimensions

D. Review and Testing

1. Review materials

2. Module Examination; Trainee must score 70 percent or higher to receive recognition from NCCER and course credit.

3. Performance Testing; Trainee must perform each task to the satisfaction of the instructor to receive recognition from NCCER. Proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.

VI. Device Boxes

A. Introduction to device boxes

1. Introduction
2. Type of Boxes

B. Sizing Outlet Boxes

1. Sizing Outlet Boxes
2. Pull and Junction Boxes

C. Installing Boxes

1. NEC Requirements
2. Making Connections

D. Review and Testing

1. Review materials

2. Module Examination; Trainee must score 70 percent or higher to receive recognition from NCCER and course credit.

3. Performance Testing; Trainee must perform each task to the satisfaction of the instructor to receive recognition from NCCER.

Proficiency noted during laboratory exercises can be used to the Performance Testing requirements.

VII. Hand Bending

A. Introduction to Hand Bending

1. Hand Bending Equipment
2. Geometry Required to Make a Bend
3. Making a 90 degree Bend
4. Back to Back Bends

B. Offset and Saddle Bends

1. Making an Offset
2. Parallel Offsets
3. Saddle Bends

C. Joining Conduit

1. Cutting, Reaming, and Threading Conduit
2. Cutting and Joining PVC Conduit

D. Review and Testing

1. Review
2. Module Examination; Trainee must score 70 percent or higher to receive recognition from NCCER and course credit.
3. Performance Testing; Trainee must perform each task to the satisfaction of the instructor to receive recognition from NCCER. Proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.

VIII. Raceways and Fittings

A. Introduction to Raceways and Conduit

1. Introduction
2. Raceways
3. Conduit

B. Metal Conduit

1. Metal Conduit Fittings
2. Making a conduit to Box Connection

C. Fittings, Fasteners, and Supports

1. Seal Fittings
2. Fasteners and Anchors
3. Raceways and Supports

D. Wireways and Cable Trays

1. Wireways
2. Cable Trays
3. Storing Raceways
4. Handling Raceways
5. Ducting

E. Construction methods

1. Construction Methods

F. Review and Testing

1. Review materials
2. Module Examination; Trainee must score 70 percent or higher to receive recognition from NCCER and course credit.
3. Performance Testing; Trainee must perform each task to the satisfaction of the instructor to receive recognition from NCCER. Proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.

IX. Conductors and Cables

A. Introduction to Conductors

1. Introduction
2. Wire Size
3. Ampacity

4. Conductor Material

5. Conductor Insulation

B. Specialty Conductors

1. Fixture Wires

2. Cables

3. Instrumentation and Control Wiring

C. Installing Conductors in Conduit Systems

1. Pulling Systems

2. Safety

3. Feeding Conductors into Conduit

4. Terminating Conductors

D. Review and Testing

1. Review materials

2. Module Examination; Trainee must score 70 percent or higher to receive recognition from NCCER and course credit.

3. Performance Testing; Trainee must perform each task to the satisfaction of the instructor to receive recognition from NCCER. Proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.

X. Basic Electrical Construction Drawings

A. Introduction, The Drawing Set

1. Drawing Layout

2. Drafting Lines

3. Electrical Symbols

4. Scale Drawings

B. Analyzing Drawings

1. Analyzing Electrical Drawings

2. Power Plans

3. Lighting Floor Plan

4. Electrical Details and Diagrams

C. Specifications; Review and Testing

1. Written Specifications

2. Review materials

3. Module Examination; Trainee must score 70 percent or higher to receive recognition from NCCER and course credit.

4. Performance Testing; Trainee must perform each task to the satisfaction of the instructor to receive recognition from NCCER. Proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.

XI. Residential Electrical Services

A. Introduction; Sizing Electrical Services
   1. Introduction
   2. Sizing Electrical Service
   3. Sizing Residential Neutral Conductors
   4. Sizing the Load Center

B. Grounding
   1. Grounding Electrical Services
   2. Main Bonding Jumper

C. Installation, Part One
   1. Installing the service Entrance
   2. Panel Board Location
   3. Wiring Methods
   4. Equipment Grounding System
   5. Branch Circuit Layout for Power

D. Installation, Part Two
   1. Branch Circuit Layout for Lighting
   2. Outlet Boxes
   3. Wiring Devices

E. Electric Heating; Pools; Review and Testing
   1. Electric Heating
   2. Residential Swimming Pools, Spas, and Hot Tubs

3. Review materials
4. Module Examination; Trainee must score 70 percent or higher to receive recognition from NCCER and course credit.
5. Performance Testing; Trainee must perform each task to the satisfaction of the instructor to receive recognition from NCCER. Proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.

XII. Electrical Test Equipment

A. Introduction; Electrical Test Equipment
   1. Voltmeter
   2. Ohmmeter
   3. Ammeter and Multimeter
   4. Megohmmeter and Other Instruments
   5. Category Ratings and Safety
   6. Review materials
   7. Module Examination; Trainee must score 70 percent or higher to receive recognition from NCCER and course credit.
   8. Performance Testing; Trainee must perform each task to the satisfaction of the instructor to receive recognition from NCCER. Proficiency noted during laboratory exercises can be used to satisfy the Performance Testing requirements.