

(TENTATIVE)

## High School Lineworker Elective Program

Sunday June 11, 2023

5:00 – 8:00 PM

Check into dorms, dinner, introductions, schedule, emergency procedures, orientation, etc.

Monday June 12, 2023

(Bismarck Public Schools Career Academy Electronics Classroom)

### Morning Session:

#### Direct Current Theory

1. Describe is electricity, atomic theory, electron movement, direct current.
2. Sources of DC.
3. Describe voltage, current and resistance.
4. Utilize Ohm's law to show the mathematical relationship between volts, amps and ohms.
5. Define series and parallel circuits.
6. Use Ohm's law to calculate missing values (E,I & R) in series and parallel circuits.

### Afternoon Session:

#### Lab

1. Test equipment familiarization - Multimeter, breadboard, DC power supply.
2. Construct (breadboard) a basic **series circuit** utilizing resistors, switches and lamps with a DC power source.
3. Calculate E, I & R at various points in the circuit.
4. Utilize a multimeter to measure and confirm your calculations.
5. Analyze and troubleshoot to resolve discrepancies between calculations and measurements.
6. Construct (breadboard) a basic **parallel circuit** utilizing resistors, switches and lamps with a DC power source.
7. Repeat steps C, D and E.

### Evening Session:

#### Lineworkers tools and safety Lab

Bismarck State College Mandan Lineworkers Facility

Tuesday June 12, 2023

(Bismarck Public Schools Career Academy Electronics Classroom)

### Morning Session:

#### Alternating Current Theory

1. Describe alternating current.
2. Sources of AC.
3. Compare and contrast with direct current voltage, current and resistance, Ohm's law, etc.
4. Transformer theory
  - Step up/down, Turns ratio vs resistance ratio, Transformer types ie; center tap.

## **Afternoon Session:**

### **Lab**

1. Test equipment familiarization  
Multimeter, breadboard, AC power supply, oscilloscope.
2. Construct (breadboard) a basic **series circuit** utilizing resistors, switches and lamps with an AC power source.
3. Calculate E, I & R at various points in the circuit.
4. Utilize a multimeter to measure and confirm your calculations.
5. Analyze and troubleshoot to resolve discrepancies between calculations and measurements.
6. Construct (breadboard) a basic **parallel circuit** utilizing resistors, switches and lamps with an AC power source.
7. Repeat steps C, D & E.
8. Measure Voltage at various points in the circuit with an oscilloscope and confirm with a multimeter.
9. Transformer labs –
  1. Measure resistance input and output windings of various transformers to calculate turns and voltage ratios.
  2. Apply low voltage AC to various transformers and confirm calculations from step 1.
  3. Use an oscilloscope to view and measure the AC waveforms across a transformer.

## **Evening Session:**

### **Lineworkers tools and safety Lab**

Bismarck State College Mandan Lineworkers Facility

Wednesday June 13, 2023

Bismarck State College Lineworkers Facility

- Power line apparatus, transformers, connections, substation and switchyard functions, line fuses, oil circuit reclosers, etc.

Thursday June 14, 2023

- Industry Tours – (power plant, switchyard, substation, control room, etc.)

## **Morning:**

Friday June 15, 2023

Dorm check-out

Course evaluation

Speakers

REC internships

Scholarships

BPS grade and credit

BSC Lineworkers Program