



## Delaware Event for 2018

### THE WONDERS of ELECTRICITY DIV B & C

#### 1. DESCRIPTION:

- The purpose of this event is to improve awareness of the wondrous properties and interactions of electricity, magnetism and semiconductor materials as they contribute to our daily lives.
- Raise awareness of electrical safety.

A TEAM OF UP TO: 2

APPROXIMATE TIME: 50 minutes

#### 2. EVENT PARAMETERS:

- Students are allowed to use any notes and/or calculators. Notes must be secured in a 3-ring binder of any size, so that regardless of orientation nothing falls out.
- The event supervisor will provide any needed measurement equipment such as multimeters or probes. Students are encouraged to bring their own multimeter for use.
- No laptops or smart phones will be allowed.
- No personal safety equipment is required.
- Event Sponsor will provide several training workshops. Students and coaches are encouraged to attend one of the workshops.

#### 3. THE COMPETITION:

SCOPE: Students will be expected to demonstrate knowledge of the following:

- A historical perspective of the discoveries of electricity and the key people involved.
- The properties of electrical charge, sources and hazards of static electricity. Coulomb's Law and capacitance
- Direct current(DC) characteristics, sources, uses, simple circuit diagrams, DC hazards
- Alternating current(AC) characteristics, sources, uses, AC hazards
- Units of current, voltage, resistance, power and energy and using Ohm's law.
- (For Division C Only) Simple circuit analysis using Kirchhoff's Voltage & Current Laws**
- (For Division C Only) Basic digital logic and digital logic operations.**
- (For Division C Only) Time constant of a resistor and capacitor circuit.**
- Magnetic poles, magnetic fields, electromagnets, inductance and transformers. Right-hand rule for motor torque
- Electrical Controls Devices including – 3 Way light switch circuit
- Electrical characteristics of a silicone PN junction
- Making simple measurements of a circuit
- Operation of a silicone photocell and methods to increase the output voltage of a solar panel.
- Characteristics and operation of a light emitting diode (LED)
- (For Division C Only) Basics and application of Operational Amplifiers (OpAmps)**

#### TESTING:

The Division B competition will be 30% hands-on tasks related to the scope areas listed above and 70% written exam. The Division C competition will be 50% hands-on tasks related to the scope areas listed above and 50% written exam.

#### 4. SCORING:

- Points will be awarded for correct answers and/or proper technique.
- Ties will be broken using a designated task or question(s), which will be the same for all teams and will be identified before all periods.

#### 5. Recommended Resources:

- Schaum's Outline of Basic Electricity by Milton Gussow
- UD / IEEE Delaware Bay Section Workshops on Electricity and Electronics. These will be held on Saturdays in January at the Electrical & Computer Engineering Department in Newark. Check the Delaware Science Olympiad Website for details.**