

## 4-H MECHANICAL SCIENCE

Superintendent: Will Klein

Committee: Bob Book, Josh Blaine, Joe Klein

1. All rules (pages 10-11) apply.
2. Exhibitor should be present while judging takes place or have prepared statements to answer question in 4-H rules.
3. Table displays should be limited to 2' wide by 15" deep and posters 22"x30" unless otherwise stated in project area for State Fair. For Lee County size restrictions do not apply. Exhibits over 4 feet tall will be displayed on the floor.

### **AEROSPACE**

One State Fair Delegate may be chosen from the following (\*) classes.

#### Class Name

- \***Model Rocketry** - Exhibit one model rocket. The exhibit will be a static display. The model rocket should be in good flying condition. DO NOT include the rocket engine with your exhibit. The rockets will not be launched. Member should bring the printed directions for construction of the rocket.
- \***Aerospace Display** - Any exhibit related to aerospace that does not fit into class above. This may be an experimental or educational poster or display. Include an explanation of the display for public understanding.

### **BICYCLE**

Two State Delegates may be selected to participate in the Bicycle Rodeo at State Fair from (\*) classes.

#### Class Name

- Bicycle I** - Exhibit a poster showing the parts of a bicycle **OR** exhibitor should bring bicycle and be able to demonstrate two bicycle adjustments (seat, handlebars, brakes, etc.) . Exhibitor must furnish any tools.
- \***Bicycle II** - Exhibit a poster or display showing a checklist of tasks that need to be done for bicycle. Include how often these tasks should be completed **OR** exhibitor should bring bicycle and demonstrate two maintenance practices (oiling, chain adjustment, spoke replacement, etc.), or bicycle adjustments. Exhibitor must furnish tools.
- \***Bicycle III** – Exhibitor will be asked to demonstrate 2 maintenance practices: 1) change a tire on a rim **AND** 2) perform one of the following: Adjust the brake shoes, cable tension, de railer, or head set **OR** remove and replace a rear wheel **OR** true a wheel.

### **ELECTRICITY & ELECTRONICS**

Three State Fair Delegates may be chosen from the following (\*) electricity classes and one from the electronics class.

It is strongly suggested members use recommended construction details including proper color coding, provided by the (IEC) Illinois Electrification Committee that can be provided on the IEC 4-H website:  
<http://www.iecouncil.org/4h.html>

#### Class Name

- \***Electricity I, Magic of Electricity** – (May only be battery-powered projects using battery components and wiring). Projects using paper clips, cardboard, thumbtacks, & brads are not to be exhibited. Exhibit a momentary switch, simple switch, or basic circuit **OR** an Electromagnet **OR** a Galvanometer **OR** an Electric motor. All projects must include a report explaining how the project was constructed and the principles demonstrated.
- \***Electricity II, Investigating Electricity** - (May only be battery-powered projects using battery components and wiring) Projects using paper clips, cardboard, thumbtacks, & brads are not eligible for state fair exhibits. Exhibit a Circuit board demonstrating parallel and series switches, including a circuit diagram **OR** 3-way or 4-way switch circuit using DC/battery **OR** Basic electrical device (examples: Rocket launcher, burglar alarm, etc). All projects must include a report explaining how the project was constructed and the principles demonstrated.
- \***Electricity III, Wired for Power** - Exhibit a 120V lighting fixture or other appliance which used a switch, **OR** two electrical household circuits using 120V materials to comply with the National Electrical Code, one with a simple on/off switch to control bulb, and one using 3-way switches to control light from two locations, **OR** other project which demonstrate the principles in the Wired for Power manual. All projects must include a written report explaining how the project was constructed, and principles for its operation.
- \***Entering Electronics** - Exhibit any electronic or solid-state appliance. Exhibitor must be able to explain how the project was constructed, how it is to be used and how it works. When project is being constructed, general safety and workmanship should be considered.

## GEOSPATIAL

Two State Fair Delegates may be selected from these (\*) classes.

- \***Geospatial: Exploring Spaces, Going Places, Level I** – Exhibit one of the two options listed below: Using the “Take Me on a Tour” activity, create a display and map showing four to six tour sites, geo-tools used to create the map, positional data for the sites, and information about the selected sites. OR Using information from the “What Are Geographical Tools?” activity, prepare an exhibit showing and describing ten mapping tools. Explain how the mapping tools are used and why maps are important.
- \***Exploring Spaces, Going Places, Level 2** – Using the table from the “Take Me on a Tour” activity, create a map showing recreational, historical or public service sites in your community. Determine if there is a need for additional community resources. Make written suggestions for what resources should be added and where they should be located on your map.
- \***Exploring Spaces, Going Places, Level 3** – Create a computer-generated map with layered data that provides information on a community need. Explain how the need was identified; how you gathered information; and your recommendations on how to solve the need. Use the template from “Take Me on a Tour” activity to gather data for the map.

## ROBOTICS

Two State Fair Delegates may be selected from the following (\*) classes.

- \***Robotics Explorer, Chapter 1** – Create a computer slideshow or science board display describing 3-5 examples of robots and their uses in the real world. Label and describe what makes each robot more than a machine or computer.
- \***Robotics Explorer, Chapter 2** – Use your robot to demonstrate OR create a display of a program you wrote to make a robot travel in a square. Provide a narrative that describes your experience designing and troubleshooting this program.
- \***Robotics Explorer, Chapter 3** – Use your robot to demonstrate OR create a display of a line tracking program you wrote that uses input from a sensor (e.g. touch, light). If an exhibitor brings a robot, bring a mat or track for demonstration purposes. Provide a narrative that describes your experience designing and troubleshooting this program.
- \***Robotics Explorer, Chapter 4** – Use your robot to demonstrate OR create a display of a line tracking program you wrote that combines input from two sensors. If an exhibitor brings a robot, bring a mat or track for demonstration purposes. Provide a narrative that describes your experience designing and troubleshooting this program.
- \***Robotics Probe, Chapter 1** – C Use your robot to demonstrate OR create a display of a line tracking program you wrote that uses a rotational sensor to determine distance traveled or to control turns. If an exhibitor brings a robot, bring a mat or track for demonstration purposes. Provide a narrative that describes your experience designing and troubleshooting this program.
- \***Robotics Probe, Chapter 2** – Use your robot to demonstrate OR create a display of an experiment you designed to test the travel distance and speed of a robot designed using different gears. Provide a picture of the robot you designed with all gear types, pulleys and belts labeled. Provide a narrative that analyzes the results of your experiment.
- \***Robotics Probe, Chapter 3** – Use your robot to demonstrate OR create a display of a line tracking program you wrote that uses advanced programming strategies, such as using containers, loops and subroutines and using combined sensors. If an exhibitor brings a robot, bring a mat or track for demonstration purposes. Provide a narrative that describes your experience designing and troubleshooting this program.

## WELDING

**Arks & Sparks** - Exhibit a project that has been constructed or repaired using techniques as described in the Arks and Sparks manual. **OR** Exhibit a display related to something found in the project manual.

## SMALL ENGINES

One State Fair Delegate may be chosen from the (\*) classes.

NOTE: For State Fair there is a size limit of a 4'X4' display; engines must be smaller than 20 horsepower. No complete engines are permitted for display at State Fair.

- \***Display** - Exhibit a display selecting from one of the following options: 1) A display identifying different engine or lawn and garden equipment parts or a display showing the function of the various engine or lawn and garden equipment parts, **OR** 2) A display identifying and explaining the function(s) of different specialty tools needed for small engine work, **OR** 3) A display illustrating and providing the results of any one of the experiments included in the project book.
- \***Maintenance** – Exhibit a display that illustrates either 1) routine maintenance procedures **OR** 2) diagnosing and troubleshooting specific problems with an engine.
- \***Clover Challenge** - Exhibit a display illustrating the Clover Challenge area explored. This could include anything NOT covered in the project books, including but not limited to career exploration, safety issues, antique small engines, etc. The completed Illinois 4-H Clover Challenge Agreement must be presented with the exhibit.

## TRACTOR CARE

One State Fair Delegate may be chosen from the (\*) classes.

Exhibits for county are not limited in size but must be limited to a space of 2' wide and 15" deep for State Fair.

- \***Tractor I: Starting Up** – Exhibit a display or poster that illustrates one of the following topics: tractor safety; care and maintenance; the tractor as a valuable farm machine; or an activity listed in the project manual.
- \***Tractor II: Tractor Operation** – Exhibit a display or poster that illustrates one of the following topics: cause and prevention of rollovers, diagram how an air cleaner works, diagram & identify an engine cooling system, regulations for battery & oil disposal, or another activity listed in the 4-H project manual.
- \***Tractor III: Moving Out** – Exhibit a display or poster that illustrates one of the following topics: wagon and bin hazards, diagram and identify open and closed hydraulic systems, mower types and safety features conveyor types and safety features, or another activity listed in the 4-H project manual.
- \***Tractor IV: Learning More** – Exhibit a display or poster that illustrates one of the following topics: method of winterizing a tractor, chemical uses and required safety equipment, parts and process of internal combustion engine, procedure for cleaning and flushing tractor radiator, or another activity.

## WOODWORKING

Two State Fair Delegates may be chosen from the following (\*) classes.

- \***Unit 1 - Measuring Up** – Exhibits in this class are to be basic projects. If a superintendent feels a project is too advanced for this class it will be moved to the next level. Suggested projects include **simple** projects such as a napkin holder, small foot stool, coat rack, box with lid, or bird house.
- \***Unit 2 - Making the Cut** - Exhibit an item made of wood constructed by the member incorporating the skills and techniques emphasized in the project manual.
- \***Unit 3 - Nailing it Together** - Exhibit an item made of wood constructed by the member incorporating the skills and techniques emphasized in the project manual.
- \***Unit 4 - Finishing Up** - Exhibit an item made of wood constructed by the member incorporating the skills and techniques emphasized in the project manual.
- \***Refinishing** – For members in Woodworking I, II, III and IV. Exhibit an item refinished by the 4-H member.

## COMPUTER SCIENCE

Two State Fair Delegates may be chosen from the following (\*) classes

1. Exhibitors will be asked to explain their entry to the judge. Use of an actual computer is acceptable but not required. Neither the Fair Association or the Extension Office will be held responsible for your computer's safety. No phone lines or internet connections will be available for use with your exhibit.
2. Any member found to be using computer software in a manner that infringes on copyright laws, will be disqualified.

### Class Name

**\*Newbie Know-How** – Create a computer slideshow to share what you have learned about computer basics or using the Internet to gather information; **OR** exhibit a printed or electronic copy of product(s) using office software applications. Bring a science board display or a laptop computer to share your work.

**\*Peer to Peer** – Create a computer slideshow to share what you have learned about creating and using computer networks or using networks for online collaborations. Bring a science board display or a laptop computer to share your work.

**\*Inside the Box** – Create a computer slideshow to share what you have learned about computer operating systems, troubleshooting, tuning-up a computer, or other topics listed in your manual. Bring a science board display or a laptop computer to share your work.

**\*Teens Teaching Tech** – Create a computer slideshow to share what you have learned about teaching others how to use computers, technology needs or resources in your community, activities to create access to technology, or other topics listed in your manual. Bring a science board display or a laptop computer to share your work.

**\*Beginning Computer Programming** - Exhibit a flowchart or alternative visual representation of a program that exhibitor has written, not copied from another source. Exhibitor may also choose to demonstrate the actual program. (NOTE: Neither computers nor connections are provided to exhibitors at the fair.) Choice of programming language is optional. Programs in this class require the use of one or more of each of the following kinds of commands:

- 1) Commands to the reader of the program (e.g., "Now subtract Taxes from Gross Pay to get Net Pay")
- 2) Instructions to the user of the program (e.g., "Press Q at any time to quit this program").
- 3) Assignment of data into variables (e.g., "NetPay=GrossPay-Taxes;").
- 4) Choosing between alternatives based on the current value of a variable (e.g., "IF Net Pay >= 100000 THEN PRINT 'THANK YOU, BOSS!' ELSE GOTO 999").
- 5) Looping, that is, repeating a group of instructions more than once, using a looping structure ("FOR", "DO", etc) the ending of the loop must be controlled, not just left to loop forever (e.g., "10 GOTO 10"). Controlling the end of the looping may be done using an "IF" statement from item 4.
- 6) Input from, and output to a user.

**\*Advanced Projects** – These projects should demonstrate high levels of knowledge, skill and experience, and involve either a) programming beyond the scope and sophistication of the beginning programming class, **OR** b) and integrated project of product which does not readily fit into any of the other class descriptions (e.g., designing animation programs; describing a computer-based business which the member operates).

**\*Clover Challenge** -Exhibit a display illustrating the Clover Challenge area explored. This could include anything NOT covered in the project books, including but not limited to career exploration of computers in broadcasting or advertisements, etc..

Trophies will be presented to:

Best of Show Aerospace

Best of Show Electricity & Electronics

Woodworking I Champion

Woodworking III Champion

Best of Small Engines & Tractor

Woodworking Refinishing Champion

Woodworking II Champion

Woodworking IV Champion