2025
RIVER VALLEY
4-H
ENGINEERING & TECHNOLOGY
RULES AND GUIDELINES

K-STATE Research and Extension | River Valley District

ENGINEERING & TECHNOLOGY EDUCATIONAL EXHIBIT

(Class option for all STEM projects)

1. For notebooks, display boards, and posters, no additional exhibit information is required; no manila envelope is needed for these exhibits.
2. Exhibits are to have a **clear link to the Engineering and Technology areas** of Aerospace/Rocketry, Ag Mechanics Welding, Astronomy, Building Block Engineering, Computer Science, Robotics, or Uncrewed Aerial Systems.
3. ~~3.~~ Exhibits in posters, notebooks and display boards must contain substantial supporting educational materials.
4. Educational display boards, posters and notebooks should be creative and showcase details about the knowledge learned in the project during the current 4-H year. Value is placed on youth who can demonstrate how their skills have increased while completing the project. Each exhibit will be judged on uniqueness, creativity, neatness, accuracy of material, knowledge gained, and content. An exhibit judging score sheet available at https://www.kansas4-h.org/educational-experiences/fair-resources/kansas-state-fair/docs/2024/2024_ksf_scoresheets/ET%20Posters%20Displays%20Notebooks%20Score%20Sheet%20All.pdf. For example, a rocket that may have crashed and/or is highly damaged may be made into an educational display or poster that tells a great story with many lessons learned.
5. Follow copyright laws, citing all sources of information in a standard notation Sources of information must be cited on the front of your exhibit, including all posters and educational display boards.
6. Educational displays are not to exceed a standard commercial 4' high x 3' wide x 2' deep board. No card table exhibits will be allowed. Care should be taken to use durable materials that will withstand Kansas State Fair conditions.
7. Posters are limited to commercial 3' x 4' tri-fold display boards.
8. "Construction Kits" that are part of Educational displays must be contained in cases (tackle boxes, sealable containers, etc.) that may not be larger than 1' x 2' x 2' and must have a latch which securely keeps all components contained in the "Construction Kits". Other components are to adhere to appropriate dimensions as stated elsewhere.
9. Educational Project notebooks must be organized in a 3-ring binder.
10. Any three-dimensional poster or display board exhibits may not be thicker than 2 inches.
11. Engines and igniters for rockets ARE NOT permitted with the exhibit and constitute an immediate disqualification. This is for safety reasons and includes both spent and live engines.
12. Exhibitor's name, club, age, and year(s) in project must be tagged or labeled on the back of the exhibit. Exhibit cards are not sufficient as they may be removed or repositioned for display. Failure to label an exhibit may result in one ribbon placing deduction.
13. Exhibits should possess the following qualities (in no particular order):
    a. A central theme
    b. What you want others to learn
    c. Be designed and constructed in a manner befitting the exhibit
    d. Be something you are interested in
14. If a safety violation is noted by the judges, superintendent, or other staff, the exhibitor's exhibit, at the judge's discretion, will receive a participation ribbon.

AEROSPACE/ROCKETRY

The Kansas 4-H Engineering and Technology Aerospace/Rocketry program is designed to allow 4-H members to explore aerospace through rockets of various sizes. Kansas 4-H has adopted the National Association of Rocketry's rules, regulations, and safety guidelines.

Rules

A. Exhibit Information for ALL rocketry categories

1. All revisions of all forms previously released for the division either undated or dated prior to current year are void for use and new forms must be obtained and used that are dated by the State 4-H Office for the current year. Use of old forms should result in the loss of one ribbon placing for exhibits.
2. Relevant documents may be obtained from County Extension Offices or from http://rocketry.engtech4ks.com/
3. NAR refers to the National Association of Rocketry and its governing board.
4. Tripoli refers to the Tripoli Rocketry Association and governing board.
5. All NAR documents~~,~~ referenced herein can be found at http://www.nar.org.
6. If a fire "burn ban" is in effect for any county in Kansas, exhibitors in any Kansas County are not required to launch their rocket(s). All requirements for the launching of rockets for the state fair and the documenting of the launching are suspended for the duration of the ban.
7. See the first section for full details about exhibiting posters, display boards and notebooks.

B. Exhibit Definitions for ALL rocketry categories

1. As defined by the National Association of Rocketry (NAR), a scale model is "any model rocket that is a true scale model of an existing or historical guided missile, rocket vehicle, or space vehicle, that has flown under rocket power." The intent of scale modeling is, according to the NAR, "is to produce an accurate, flying replica of a real rocket powered vehicle that is judged for craftsmanship in construction, finish, and flight performance." (NAR "Model Rocket Sporting Code" 52.1 (https://www/nar.org/contest-flying/competition-guide/)
2. Adult supervision is defined as being under the direct supervision of someone 18 years of age or older.
3. For the purposes of Kansas 4-H Engineering & Technology, a mid-powered rocket is defined as a rocket that uses an 'E', 'F', 'G', or equivalent engine for launch. In addition, rockets also qualify for mid-power if they meet any of the following criteria:
    a. Are 2 inches or greater in diameter (not including fins) and taller than 3 feet (36 inches including fins) and do not use an engine(s) exciding 160.01 Newton seconds of total impulse (an 'H' engine equivalent or above).
    b. The total impulse of all engines used in the rocket is greater than 20.01 Newton-seconds and less than 160.01 Newton-seconds.
4. For the purposes of Kansas 4-H a high-powered rocket is defined as a rocket that meets any of the following criteria:
    a. Weighs more than 3.3125 pounds (53 ounces or 1500 grams) at the time of launch;
    b. Uses a 'H' engine or larger to launch
    c. The total impulse of all engines used in the rocket is greater than 160.01 Newton-seconds of thrust.
    d. Includes any airframes parts of ductile~~,~~ metal, though, the use of ductile metal is strongly discouraged.
    e. Models powered by rocket motors not classified as model rocket motors per NFPA 1122, e.g.:
        i. Average thrust in excess of 80.01 Newtons
        ii. Contains in excess of 125 grams of propellant and are limited to only H and I motors.
        iii. Uses a hybrid motor or a motor designed to emit sparks
5. High power certification is defined as having successfully completed a certification program for high-powered rocketry through the NAR or Tripoli and maintaining that certification. This applies to all membership levels in the NAR and Tripoli. Specifically, the "Formal Participation Procedure" for the "Junior HPR Level 1 Participation Program" as outlined by the NAR and the "Tripoli Mentoring Program (TMP) as outlined by Tripoli.
6. NAR safety codes for launching and construction of all rockets are assumed to be used by all 4-H exhibitors and will be considered during judging.
7. For the purposes of Kansas 4-H, NO rocket may be launched using engines totaling more than an 'I' impulse engine or 640 Newton-seconds of total thrust.

C. Exhibit Rules for ALL rocketry categories

These rules apply to how rockets are to be displayed at the state fair and what those displays should and should not contain. These rules apply to all rockets displayed in the Engineering & Technology division.

1. Exhibits can change class numbers between county fairs and the state fair, as counties may not offer all class numbers and an exhibit more appropriately aligns with a different class, all entries must still be part of the rocketry division.
2. The report that accompanies the rocket must be limited to the 4-H Rocket Exhibit Information Form which is affixed to a 10" x 13" envelope. This envelope should NOT be attached to the rocket stand or rocket. The information form should be signed by the exhibitor. This may be downloaded from http://rocketry.engtech4ks.com/ Any rocket exhibit not including this completed envelope will receive participation ribbon.
3. Plans (or a photocopy) must be placed inside the envelope:
    a. This includes original design rockets.
    b. For original design rockets, the exhibitor must provide all necessary details to construct the rocket, require the rocket to be swing tested, and documented to show a stable flight. Failure to test and document flight stability following modifications will result in two ribbon placing deductions.
    c. If a rocket kit has been modified structurally, notations need to be given indicating the changes made, either by notations on the Rocket Exhibit Information Form or by placing notes in the plans. Such modifications require the rocket to be swing tested and documented to show a stable flight. Failure to test and document flight stability following modifications will result in two ribbon placing deductions. A different pant scheme, changes/reduction in decals, and other non-structural changes are not considered modifications and do not need to be documented.
4. One or more photographs of the rocket during construction and at the launch site are required:
    a. Photographs showing the rocket at the moment of ignition are preferred.
    b. Photographs must be mounted on one side of 8 ½" x 11" page(s).
    c. There must be at least 1 page of photos and no more than 5 pages of photos.
    d. Include at least one photo showing rocket construction, preferably with the exhibitor included.
    e. Do not include photos of members catching their rockets as they return to earth. This is an unsafe practice, and we do not recommend or condone this practice.
    f. Pictures at the launch site are not required in the event of a burn ban.
5. To exhibit in this division:
    a. The rocket must have been flown unless a burn ban is in effect.
    b. Support rods must not extend past the tip of the highest nosecone on the model. This reduces the likelihood of eye pokes.
    c. Support rods must remain in the upright position, 90 degrees to the display base, do not angle. Support rods may be angled if the rocket itself still remains in the upright position, for example if engine tubes are slanted and the best form of support for the rocket is to use an angled support post. If the rocket is not perpendicular to the display base, the judge should deduct one ribbon placings. The exhibitor's name and county/district must be labeled on the base.
    d. No model may be submitted on a launch pad
6. Launches should not be conducted in winds above 20 mph and will constitute a disqualification of rocket exhibit.
7. All rockets must have a safe method of recovery, e.g., parachute, streamer or tumble recovery. Any rocket without a recovery system will be disqualified.
8. The altitude achieved by the rocket is to be determined using a method other than estimation. Examples of accepted methods include altimeter, computer software, range finders, etc. If additional space is needed to show calculations of how the altitude was achieved one additional page may be added to the rocketry information pack.
9. Flight damage is to be documented by the participant on either the construction plans, an additional sheet of paper titled "flight damage" or the 4-H Rocket Exhibit Information Form.
10. The judging of flight damage is to be secondary to all other aspects of the model and only then may it even be considered. However, under no circumstance may flight damage be grounds for disqualification.
11. Accidental Damage - Any damage to an entry while it is in the custody of the judges, assistant/superintendents, or extension staff must not be held against the exhibitor. For example escape towers being knocked off the top of rockets during transport (both the escape tower and rocket may still be judged). Such damage is to be reported and documented.

12. Improvements – May be made to the exhibit prior to the State Fair to improve the overall presentation of the exhibit while maintaining the major substance of the exhibit. For example, a cooking entry of a cookie is re-prepared between a county and state fair, most likely using recommendations from the first judging, it's the same recipe just with improved technique.
13. Engines and igniters, under any circumstance, ARE NOT permitted with the exhibit and constitute an **immediate** disqualification.
14. If an engine becomes stuck, jammed, wedged, or in any other way permanently affixed in or to a rocket and cannot be removed from the rocket, the rocket will be subject to immediate disqualification. This is because it is not possible to make a full and immediate assessment of the safety of the rocket when it is being judged and safety is paramount.
15. Engines **may not** be used as display stands hollowed out or otherwise. Engines used as a display stand will cause the exhibit to be subject to immediate disqualification.
16. Rocket engines **should not** be used to join multi-stage rockets together.
    a. Multi-stage rockets can be displayed without having the stages connected together. In that case the final stage (the one with the nose cone) should be placed on the display stand, and other stages with a loop of string to the display stand.
    b. The different stages must be included to complete the rocketry exhibit, incomplete exhibits will be deducted at least one ribbon placing.
    c. Use of any engines to join the stages together will be subject to immediate disqualification.
17. Multi-stage rockets can be flown using just the final stage and be considered fully flown.
18. If a safety violation is noted by the judges, superintendent, or other staff, the exhibitor's rocket, at the judges' discretion, will receive a participation ribbon. All information necessary will be given to the NAR and/or TRIPOLI for investigation and possible revocation of membership.

D. Construction Rules for ALL Rockets

These rules apply to how rockets are to be displayed at the fair and what those displays should and should not contain. These rules apply to all rockets displayed in the Engineering and Technology division.

1. Rockets are to be properly assembled according to the assembly instructions.
2. Beginner kits with prefabricated (molded plastic) fin assemblies and pre-finished rockets requiring no painting are not acceptable at the State Fair and will be disqualified. County fairs may consider different rules for junior members.
    a. This rule does not apply to plastic fins that must be manually aligned and do not utilize a fin alignment mechanism, including, but not limited to fin alignment rings or spacing blocks.
    b. This rule does not apply to fiberglass, Kevlar, composite, or wood fins; especially when used for "through-the-wall" fin attachment techniques that are common in larger rockets.
    c. In addition, plastic parts for decorative and mechanical purposes (i.e. decorative nozzles and moving landing struts) are not considered fins and can consist of plastic. Decorative nozzles, etc. need to be securely fastened and not pose a safety hazard.
    d. Fin assemblies that are printed using a 3D printer are excluded from this rule. Though detailed instructions on the creation of the fin assemblies must be provided and an additional page of photos may be included to show the creation/printing of fin assemblies.
3. Angles of fins must fall within a plus or minus 2 degree variation using an approved fin alignment guide (such as KSSTAC10). An official fin guide is available from http://rocketry.engtech4ks.com/
4. Fins should be rounded or streamlined according to instructions. If the other edges are rounded to reduce drag on all exposed sides, there should be no ribbon deduction, unless instructions indicate to leave flat, or instructions say to round and rounding was not done.
5. Fins and body tubes are to be sealed with filler, sanding sealer, and/or primer to eliminate the appearance of body grooves and wood grain.
6. Fins and launch lugs are to be filleted to reduce drag and properly secure them to the model.
7. Engine mounts are to be securely attached to the body tube.
8. Any seams on plastic parts are to be sanded smooth.
9. Body tubes/airframes/engine mounts can be made from suitable materials, including, but not limited to: reinforced paper, cardboard, phenolic resin, specialized polymer resins, fiberglass, Kevlar, or other suitable structural materials. However, foam may not be used for external body or other external rocket parts.
10. The nose cone is to fit snugly but still allow for easy removal. If the shock cord frequently becomes stuck between the nosecone and body, it should be trimmed.
11. Exhibits must be uniformly painted and smoothly finished or finished as per rocket instructions, and have decals applied smoothly. The rocket should be free of "runs," "orange peel," or "crackling" in the finish.
12. Non-standard surfacing (such as textured paint) may be used if directed by the instructions, this includes scratch-built rockets.

13. Models may not be judged based on their paint scheme (colors and placement on the rocket), with the exception of rockets that fit the definition of a 'scale model.' All other rockets do not have to follow the suggested paint scheme, allowing the 4-H'er to display maximum creativity in the finishing of their rocket. Under no circumstances is the weight given to the paint scheme to be sufficient, by itself, to move a non-scale model from one ribbon placing to another.
14. "Scale models," exhibited in the scale mode class, may be judged based on their paint scheme. The judge may deduct up to one ribbon placing for not following the paint scheme.
15. Scale Model Rockets, exhibited in the scale model class are to be finished and completed with a majority (greater than 70%) of decals.

E. Model Rocketry Specific Guidelines (Ages 9 and older)

Model rockets are generally small-to-medium sized rockets that can be purchased at hobby stores that an individual(s) builds from parts similar to those found in model rocket kits.

1. Rockets classified as high or mid powered may not be entered in this category.
2. Each rocket must be able to stand freely by itself or be supported by a solid base, not to exceed 4-1/4" (four and one quarter inch) thick and 8" square. The exhibitor's name, club, and age must be labeled on the base. Rod materials should be sturdy, and not made of flimsy materials, such as coat hangers.
3. If the model rocket is greater than 4 feet tall it can be displayed without a base or displayed parallel to the ground with up to 3 notched blocks not to exceed 4" in height width and depth. The exhibitor's name, club, and age must be labeled on the base(s).
4. All exhibitors must comply with the NAR Model Rocket Safety Code that is in effect as of October 1st of the current 4-H year. However, in the event that there is a modification in this code, the Engineering and Technology Project Partnership Team may review and implement the modified code.

F. Original Design Specific Rocket Guidelines (Ages 11 and older)

To allow for youth to develop their own rockets (model, mid, and high powered) in a safe manner that displays maximum craftsmanship.

1. Original design rockets cannot be a modification of a pre-existing kit and must be of original design.
2. Original design rockets must be designed by the exhibitor(s).
3. Original design rockets must include detailed instructions, so that someone could construct the original designed rocket just like a kit purchased at a store. Instructions can be as many pages as needed to convey full and complete construction techniques.
4. Original design rocket instructions should not include copies of instructions in part or in whole from existing kits without crediting the source instructions. For example, "Fin alignment template from Estes Baby Bertha."
5. For a rocket entered in the original design classes, describe in the summary how the rocket was tested for stability prior to flying. Swing testing of the rocket is required. Other tests and calculations are strongly encouraged. Exhibitors must include documentation of the swing test. Failure to swing test a rocket will result in a deduction of TWO ribbon placings.

Scoresheets, Forms, and Contest Study Materials:

- Rocket Fin Guide – Up to 8 Fins
- Rocket Fin Guide – 3 Wings
- Rocket Fin Guide – 5 Wings
- http://rocketry.engtech4ks.com/
- Rocketry Scoresheet
- High and Mid-Power Rocket Scoresheet
- Rocketry Exhibit Form

Classes

Division I – Junior Division (4-H age 7-8)

Class 3601 Rocket made from kit. Include plans.
Class 3602 Rocket Novice Kit - Assembled, not constructed (Snap together)
Class 3603 Scale Model Rocket made from kit includes plans Rocket designed by exhibitor; not merely a modification of an existing kit. Include original plans.
Class 3604 Educational Exhibit, a notebook, poster or display

Division II – Intermediate Division (4-H age 9-13)

***Class 3605 Rocket made from kit.** Include plans.
***Class 3606 Scale Model Rocket made from kit.** Include plans.
***Class 3607 Scale Model Rocket designed by exhibitor** not merely a modification of an existing kit. Include original plans and stability testing. **(Only State Fair eligible for youth 4-H age 11-13)**
***Class 3608 Rocket designed by 2 or more exhibitors**, not merely a modification of an existing kit. Include original plans. This class is designed to encourage teamwork among individuals and clubs to work on a rocket from the initial design to the finished project. **(Only State Fair eligible for youth 4-H age 11-13)**
***Class 3609 Educational Exhibit**, a notebook, poster or display

Division III – Senior Division (4-H age 14-18)
***Class 3610 Rocket made from kit**. Include plans.
***Class 3611 Rocket designed by exhibitor;** not merely a modification of an existing kit. Include original plans.
***Class 3612 Scale Model Rocket made from kit.** Include plans.
***Class 3613 Scale Model Rocket designed by exhibitor** not merely a modification of an existing kit. Include original plans and stability testing.
***Class 3614 Rocket designed by 2 or more exhibitors,** not merely a modification of an existing kit. Include original plans. This class is designed to encourage teamwork among individuals and clubs to work on a rocket from the initial design to the finished project.
***Class 3615 Mid or High rocket made from kit or original design**
***Class 3616 Educational Exhibit**, a notebook, poster or display

Mid-power Rocketry (2x'D' to 'G' Engines) Guidelines:
Purpose: To allow for improved safety and judging of rockets that meet the requirements of 4-H mid-power rockets.

1. Exhibitors must be at least 14 years of age by January 1 of the current year.
2. The rules for ALL categories apply.
3. In addition to the information packet completed for all rockets, a high/mid power information form is to be completed and placed inside of the information packet. This may be downloaded from http://rocketry.engtech4ks.com/
4. Exhibitors in this division must hold memberships in either NAR or Tripoli organizations.
5. The NAR Model Rocket Safety code applies to the construction and launching of all rockets displayed in this division. As such all exhibitors must comply with the NAR Model Rocket Safety Code that is in effect as of October 1st of the current year. However, in the event that there is a modification in this code the Engineering and Technology Project Partnership Team review and implement the modified code.
6. All rockets in this division are to be launched under adult supervision by the 4-H member who constructed the rocket.
7. High power rockets as defined above ('H' or 'I' engines) may not be launched in this division.
8. If according to Federal Aviation Regulations Part 101, a waiver is required to fly the rocket, a copy of that waiver is to be attached to the High-Power Information Form. In the case where the launch was a public event a substitute to a copy of the waiver is the Range Safety Officers (RSO's) contact information, launch location, and date.
9. Mid-Power rockets may be displayed without a supporting stand. If a supporting stand is used, it is not to exceed 4-1/4" (four and one-quarter inch) thick and 8" square. The exhibitor's name, club, and age must be labeled on the base.

High Power Rocketry ('H' or 'I' engines) Guidelines
To allow for improved safety and judging of rockets that meet the requirements of 4-H high power rockets.

1. Exhibitors must be at least 14 years of age by January 1 of the current year.
2. The rules for ALL categories apply.
3. In addition to the information packet completed for all rockets, a high-power information form is to be completed and placed inside of the information packet. This may be downloaded from http://rocketry.engtech4ks.com/.
4. Exhibitors in this division must hold memberships in either NAR or Tripoli organizations.
5. The NAR High Power Rocket Safety Code applies to the construction and launching of all rockets displayed in this division. As such all exhibitors must comply with the NAR High Power Rocket Safety Code that is in effect as of October 1st of the current 4-H year. However, in the event that there is a modification in this code the Engineering and Technology Project Partnership Team may review and implement the modified code.

6. All rockets in this division are to be launched under adult supervision by the 4-H member who constructed the rocket.
7. For rockets launched using an engine(s) that have160.1 ('H' engine or equivalent amount of smaller engines) Newton's-seconds or larger, adult supervision must be provided by an individual having at least a level 1 high power certification. The 4-H member should also hold or be attempting to attain their level 1 high power certification and should include supporting documentation of such (a copy of Level 1 card is sufficient).
8. If according to Federal Aviation Regulations Part 101, a waiver is required to fly the rocket, a copy of that waiver is to be attached to the High-Power Information Form. In the case where the launch was a public event a substitute to a copy of the waiver is the Range Safety Officers (RSO's) contact information, launch location, and date.
9. High Power Rockets may be displayed without a supporting stand. If a supporting stand is used, it is not to exceed 4-1/4" (four and one-quarter inch) thick and 8" square. The exhibitor's name, club, and age must be labeled on the base.

As defined by the National Association of Rocketry (NAR), a scale model is "any model rocket that is a true scale model of an existing or historical guided missile, rocket vehicle, or space vehicle, that has flown under rocket power." The intent of scale modeling is, according to the NAR, "is to produce an accurate, flying replica of a real rocket powered vehicle that is judged for craftsmanship in construction, finish, and flight performance." (NAR "Model Rocket Sporting Code" 52.1 https://www/nar.org/contest-flying/competition-guide/)

AG MECHANICS WELDING

This project allows youth to explore areas of ag mechanics welding and metallurgy from repairing or repurposing items to the fabrication of new items. The intent is for this program to start with foundational areas, some of which youth may already have, and allow them to continue to build on this knowledge, thus becoming more experienced.

Rules

1. Wheeled exhibits must utilize a braking mechanism which prevents the exhibit from freely rolling while on display.
2. Exhibitors are responsible for providing sufficient braking or “chocks” for trailer exhibits to ensure that the exhibits do not move once positioned. If using a wheel "chocking” mechanism, the two individual blocks should be connected together as a pair of chocks, so they do not become separated. At least one pair of chocks should be placed on each side of the trailer to prevent movement.
3. For trailer exhibits the tongue of the trailer should have a locking mechanism (e.g. padlock) to prevent the trailer from being moved by unauthorized individuals while being displayed. A key for the locking mechanism should be left with the superintendent or with Extension Staff and labeled with the exhibitor’s name, club, and phone number.
4. For exhibits with downward swinging parts, such as tailgates, that could pose a fall/striking/crushing hazard should have a tamper resistant locking mechanism such as a “zip-tie” or a “cotter-key” through a release pin that would prevent the swinging part from being accidentally released and falling on someone.
5. Each exhibit must be free-standing or sufficiently supported by an exhibitor supplied support system that is moveable and is part of the total dimensions and weight of the exhibit. Exhibit display boards should have a portable and moveable base and examples should be firmly affixed to the board to ensure all parts of the display stay together. No exhibits may be staked to the ground for display.
6. Top heavy items should be braced or placed in a stand sufficient to prevent it from toppling over while on display.
7. Exhibits may not be bound, affixed, attached to the Fairground’s buildings, except by the superintendent, Fairboard representation, or Extension Staff.
8. Painting or spot painting is not allowed on projects after arrival on fairgrounds. If wet paint is detected by judges or superintendents, one ribbon placing will be deducted.
9. Repair projects having adequate original finish need not be repainted.
10. Cutting surfaces, such as blades, are to have a protective covering over them to prevent injury. The covering should be easily removed and reinstalled for judging. Foam “pool noodles” and multiple layers of cardboard are acceptable.
11. Display cases for small exhibits are acceptable and must be easily opened so the item can be removed and examined as part of judging.
12. Exhibits that include weaponry of any kind will be disqualified. Weaponry is defined as any instrument, possession, or creation, physical and/or electrical that is intended to be used to inflict damage and/or harm to individuals, animal life, and/or property.
13. Trailers and large exhibits (those larger than 5 feet in any dimension) may be displayed outside, and exhibitors with such exhibits are to contact the Extension Office **NO LATER THAN TWO WEEKS BEFORE THE FAIR.**
14. If the exhibit is powered by flammable liquids (gas, propane, kerosene, etc.) the fuel tank and lines should be drained and allowed to dry, to avoid spills and potential fires.
15. Electric powered (battery, corded, solar, or alternative energy) should have a primary shutoff or disconnect switch.
16. If a safety violation is noted by the judges, superintendent, or other staff, the exhibitor’s exhibit, at the judges’ discretion, will receive a deduction in ribbon placement or a participation ribbon.
17. The exhibitor’s name(s) and club must be tagged or labeled on the display.
18. Each exhibitor is required to complete the “4-H Ag Mechanics Welding Exhibit Information Form” for each exhibit, except for display boards, which is available through your local K-State Research and Extension office or at http://welding.engtech4ks.com/. This form must be attached to the outside of a 10” x 13” manila envelope. Do not tie the envelope to the exhibit. All revisions of all forms previously released for the division dated prior to current year are void for use and new forms must be obtained and used that are dated by the State 4-H Office for the current year.
19. Each exhibit information packet should include the following items:
    a. Bill of materials for the project with associated costs, scrap items used may be listed as having a $0.00 cost.

b. 1 to 5 pages of photos showing work on the exhibit, preferably from a beginning state to final or completed state.
c. If appropriate schematics or working drawings relating to the creation or repair, this is not required for display boards.
d. If appropriate, operating instructions.

Eligibility – Each exhibitor may enter one exhibit per class. Exhibits must have been constructed or repaired during the current 4-H year.

Resources

- Project Area –Ag Mechanics Welding
- Ag Mechanics Welding Score Sheet
- Ag Mechanics Welding Exhibit Form

Classes

Section A- Junior (4-H Age 7 and 8) This level is designed for youth with little to no exposure in the project area so they can gain an understanding of basic principles and methods in the given area.

***Class 3701 Welding display board** – a 3 foot by 3 foot display board with different pieces of metal attached illustrating different types of welds, each weld being labeled
***Class 3702 Welding ag repair** – repair of ag equipment with welding
***Class 3703 Welding ag fabrication** – creation of new ag equipment with welding
***Class 3704 Welding general repair** – repair of non-ag equipment with welding
***Class 3705 Welding general fabrication** – creation of non-ag equipment with welding
***Class 3706 Welding artistic fabrication** – creation of artistic or interpretive pieces with welding
***Class 3707 Brazing repair**
***Class 3708 Brazing fabrication**
***Class 3709 Smithing display board** – a 3 foot by 3 foot display board with different pieces of forged metal attached illustrating different forms, each form being labeled
***Class 3710 Smithing** – A design forged with at least one formed element (twists or spirals for example)

Section B- Intermediate (Age 9-13) This level is designed for youth some experience in the project area allowing them to expand on common principles and methods in the given area.

***Class 3711 Welding ag repair** – repair of ag equipment with welding
***Class 3712 Welding ag fabrication** – creation of new ag equipment with welding
***Class 3713 Welding general repair** – repair of non-ag equipment with welding
***Class 3714 Welding general fabrication** – creation of non-ag equipment with welding
***Class 3715 Welding artistic fabrication** – creation of artistic or interpretive pieces with welding
***Class 3716 Brazing repair**
***Class 3717 Brazing fabrication**
***Class 3718 Smithing** – A design forged with at least two different formed elements (twists and spirals for example)

Section C- Senior (Age 14-18) This level is designed for youth with vast experience in the project area allowing them to master common principles and methods and expand on advanced techniques in the given area.

***Class 3719 Welding ag repair** – repair of ag equipment with welding
***Class 3720 Welding ag fabrication** – creation of new ag equipment with welding
***Class 3721 Welding general repair** – repair of non-ag equipment with welding
***Class 3722 Welding general fabrication** – creation of non-ag equipment with welding
***Class 3723 Welding artistic fabrication** – creation of artistic or interpretive pieces with welding
***Class 3724 Brazing repair**
***Class 3725 Brazing fabrication**
***Class 3726 Smithing** – A design forged with at least three different formed elements (twists, spirals, and bulbs for example)

Educational Displays – Notebook, poster, or display

Class 3727 Junior (4-H Age 7-8)
***Class 3728 Intermediate (4-H Age 9-13)**
***Class 3729 Senior (4-H Age 14-18)**

ASTRONOMY

This Engineering and Technology exhibit area is designed to provide youth with the opportunity to explore space through telescopes, research, and observation.

Rules

1. Each exhibitor may enter one exhibit per class.
2. Telescopes entered in this division may be built from a kit or by original design. Pre-finished telescopes, which require no construction are not acceptable exhibits.
3. Telescopes are limited to no more than six feet in length. They must be placed on a stationary stand that does not allow the telescope to roll and/or fall over. The stand cannot extend past two feet in length or width.
4. Each telescope exhibit must include a "4-H Astronomy Exhibit Information Form," which is available through your local K-State Research and Extension office or at http://astronomy.engtech4ks.com/. This form must be attached to the outside of a 10" x 13" manila envelope. Do not tie the envelope to the exhibit. All revisions of forms previously released for the Engineering & Technology division dated prior to current year are void for use and new forms must be obtained and used that are dated by the Kansas State 4-H Office for the current year. You must also include construction plans (or a photocopy) for the telescope and place it inside the manila envelope.
5. See the first section for full details about exhibiting posters, display boards and notebooks.
6. At least two photographs showing telescope construction and operation are required. Photographs should be mounted on one side of an 8 ½" x 11" page. A brief caption should accompany each photograph. Place photos in the 10" x 13" manila envelope. Up to 10 pages of pictures can be included.
7. The telescope must be properly assembled and painted with a smooth and uniform finish
8. Telescopes designed by the exhibitor must be original, not a modification of an existing kit.
9. Exhibitor's name, club, age, and year(s) in project must be tagged or labeled on the telescope.
10. If a safety violation is noted by the judges, superintendent, or other staff, the exhibitor's exhibit, at the judges' discretion, will receive a participation ribbon.

Scoresheets, Forms, and Contest Study Materials:

- Astronomy Exhibit Form
- Astronomy Scoresheet
- http://astronomy.engtech4ks.com/

Classes

Division I – Junior Division (4-H age 7-8)

Class 3801 Telescope made from kit
Class 3802 Telescope made from original design
Class 3803 Educational Exhibit a notebook, poster or display

Division II – Intermediate Division (4-H age 9-13)

***Class 3804 Telescope made from kit**
***Class 3805 Telescope made from original design**
***Class 3806 Educational Exhibit** a notebook, poster or display

Division III – Senior Division (4-H age 14-18)

***Class 3807 Telescope made from kit**
***Class 3808 Telescope made from original design**
***Class 3809 Educational Exhibit** a notebook, poster or display

BUILDING BLOCK ENGINEERING

The BBE exhibit area focuses on using architectural blocks ("Legos") to construct dioramas. This project allows youth to explore architectural design in a three-dimensional space. The intent for this program is to allow youth to explore the construct and gain knowledge through interaction with a common toy. This division is not intended for youth wishing to exhibit constructed kits. Kits and non-diorama displays should not be displayed in this division.

Rules

1. Total exhibit dimensions may not exceed 2 feet high, by 2 feet wide, by 2 feet deep.
2. The minimum exhibit dimensions must be at least 6 inches wide and deep.
3. All exhibits are required to be in a sturdy see-through enclosure with a top, bottom, and 4 sides. A 'clear' tub turned upside down with the exhibit placed on the lid would be an acceptable enclosure. It may be desirable to place a cutting board or other hard surface between the lid and base plate of the exhibit to make it sturdier. This is to keep exhibit components from being "scattered to parts unknown" at the fair. The outer dimensions of the enclosure **do not count** towards the total exhibit dimensions but should not be excessive. The entire exhibit should fit in the display enclosure, so the enclosure does not smash into the exhibit during movement.
4. All components used in construction should be dust and hair free, clean, free of chips, scuffs, cracks, or broken blocks
5. Gaps or cracks should not be visible between assembled blocks unless they fit with the story, for example an earthquake
6. The primary building component should be interlocking blocks, commonly referred to by the brand name of Lego®
7. Other components can be integrated into dioramas to illustrate architectural aspects that may be difficult to convey with traditional interlocking blocks, for example marbles for small round objects
8. The use of existing "store bought" sets for major elements of the display is not allowed, use of figurines from sets is allowed as is using individual bricks or small sub-assemblies to create something different than the set it came from. For example, a car hood or front end from a car kit could be used in a "car museum," just not the entire car. The intent of this is to ensure fairness among exhibitors and encourage maximum creativity instead of just following a set of plans.
9. Dioramas should be suitably complex and have multiple elements, for example, a camp site that has a log cabin, a tree fort, and a car.
10. All dioramas should have a story, which is part of the information pack, that describes what is happening in the diorama; this can be as simple (the nursery rhyme "Jack and Jill" for example) or complex as needed to explain to someone looking at the exhibit what is happening.
11. Vehicles that are intended to stay in a single place should be affixed to base plates with sticky tack, hot glue, or other method
12. Mechanical enhancements or motion elements that add motion to the diorama are acceptable and encouraged. For example, merry-go-rounds, doors, elevators, gears, marbles going down a channel, flapping wings, animatronics, etc. If included judges should be able to use them and instructions should be provided for operation either in the story or on a separate page.
13. Artistic designs, for example recreating paintings like the "Mona Lisa" or "Stary Nights" and structures like "David" are not permitted as exhibits and one ribbon placing should be deducted. These exhibits should be displayed in Visual Arts.
14. The exhibitor's name(s) and club must be tagged or labeled on the display. Additionally, the display case should have the exhibitor's information attached to both the lid and clear container as well, as the case may be separated from the display.
15. Entry of either a packet without an accompanying exhibit or an exhibit without a packet is not a sufficient exhibit.
16. Each exhibitor is required to complete the "4-H Building Block Engineering Exhibit Information Form" which is available through your local K-State Research and Extension office or at http://blocks.engtech4ks.com/ . This form must be attached to the outside of a 10" x 13" manila envelope. Do not tie the envelope to the exhibit. All revisions of forms previously released for the division dated prior to current year are void for use and new forms must be obtained and used that are dated by the Kansas State 4-H Office for the current year.
17. Each exhibit information packet should include the following items:
    a. 1 to 5 pages of photos showing work on the exhibit, preferably from a beginning state to final or completed state. Final pictures help in determining where a part might go in case something comes loose.
    b. If appropriate, operating instructions for mechanical portions of the diorama.

Scoresheets, Forms, and Contest Study Materials:

- BBE Scoresheet
- BBE Exhibit Form

Classes

Division I – Junior Division (4-H age 7-8)

Class 3901 Interlocking brick diorama built from scratch

Class 3902 Educational Exhibit a notebook, poster or display

Division II – Intermediate Division (4-H age 9-13)

***Class 3903 Interlocking brick diorama built from scratch**

***Class 3904 Educational Exhibit** a notebook, poster or display

Division III – Senior Division (4-H age 14-18)

***Class 3905 Interlocking brick diorama built from scratch**

***Class 3906 Educational Exhibit** a notebook, poster or display

COMPUTER SCIENCE

The Kansas 4-H Computer Science System project is designed to allow 4-H members to explore how information is moved from one part of the computer to the other; how information is moved between two or more computer systems (networking); how information is stored; or how information is acted on (programming).

Rules

1. The actual construction of computer hardware (For example, building a computer, which would include computer components plugged into a motherboard, discrete circuitry soldered on a printed circuit board, or wire-wrapped circuitry) will be entered in the Electronics Division, except for exhibits entered in Class 4003,4007, 4011 .
2. If a safety violation is noted by the judge, superintendent, or other staff, the exhibitor's exhibit, at the judge's discretion, will be disqualified. A safety violation could include Malware, a virus, or any similar program that is potentially harmful.

Exhibit Requirements

1. All exhibits in the Computer Science division must be entered on a USB drive containing all supporting documents as listed below for each class.
    a. The USB drive should be included in a manilla envelope with the Computer Exhibit Form (found at found at http://computers.engtech4ks.com/ or your local extension office) attached to the front.
    b. The USB drive should be labeled with the 4-H member's name and county.
2. Source code must be included on the USB drive for all computer programming projects coded by the 4-H member. This could include a .txt file, python file, Scratch URL, etc. Failure to include the source code will result in one ribbon deduction.
3. Each exhibit must include written operating instructions including how to locate, run, and use the project. Operating instructions should be printed and placed in the manilla envelope and included digitally on the USB drive.
4. Each exhibit must be accompanied by a typed requirements document included on the USB drive. See [link] for a template that can be used for documenting requirements.
    a. The requirements document should be started at the beginning of the project. It will include a list of goals and requirements that the 4-H member wants to include or achieve in their final project.
    b. The project requirements section is formatted as a checklist, with the 4-Her checking off what they accomplished and making adjustments throughout their work on the project as needed.
    c. Flow charts, designs, or other diagrams may be included for computer programs to show the logical flow of the program as needed.
5. For coded computer programs, it is recommended to print screenshots for display at fairs that don't have electronic displays available.
6. All electric components of micro controlled devices must be adequately covered or concealed with a protective enclosure. Paper is NOT considered an adequate enclosure or covering for electrical components.

Judging Requirements

1. Judge(s) in the computer system division will have a physical computer with the following minimum configuration to test exhibits with and view files:
    a. Microsoft Windows® 10 or Windows® 11
    b. Microsoft Office® 365 (Excel, Power Point, & Word)
    c. Microsoft Visual Studio®
    d. Microsoft Edge Browser®
    e. Mozilla Firefox® Browser
    f. Google Chrome® Browser
    g. Adobe Acrobat Reader®
    h. Apache Open Office®
    i. Scratch Desktop editor (offline version)
2. Judging of microcontrolled devices is based on the code, not the hardware.
3. Judging will be based on a score sheet that can be found at http://computers.engtech4ks.com/. There are three (3) areas each exhibit will be judged on. They are:
    a. Requirements document
    b. Operating Instructions
    c. Functionality (how well did the project meet project objectives)

Eligibility – Each exhibitor may enter one exhibit per class.

Scoresheets, Forms, and Contest Study Materials:

- http://computers.engtech4ks.com/
- Computer Science Scoresheet
- Computer Science Exhibit Form

Classes

Division I – Junior Division (4-H age 7-8)

Class 4001 Computer program, application, app, script, or coded system that is new and unique (not merely a file run in a program, such as a 'word document' or a picture drawn in 'Microsoft Paint.')

Class 4002 Coded Website- built entirely by the 4-H Member (not using a pre-made template generator such as Wix or Square Space). Items in this class could be coded in HTML, CSS, Javascript, Wordpress, or other web-based programming languages or platforms.

Class 4003 Microcontroller or Microcomputer Application- a small circuit board that is programmed to accomplish a specific task (projects built and programmed using Raspberry Pi, Arduino, etc.)

Class 4004 Educational Exhibit a notebook, poster or display

Division II – Intermediate Division (4-H age 9-13)

***Class 4005 Computer program**, application, app, script, or coded system that is new and unique (not merely a file run in a program, such as a 'word document' or a picture drawn in 'Microsoft Paint.')

***Class 4006 Coded Website-** built entirely by the 4-H Member (not using a pre-made template generator such as Wix or Square Space). Items in this class could be coded in HTML, CSS, Javascript, Wordpress, or other web-based programming languages or platforms.

***Class 4007 Microcontroller or Microcomputer Application-** a small circuit board that is programmed to accomplish a specific task (projects built and programmed using Raspberry Pi, Arduino, etc.)

***Class 4008 Educational Exhibit** a notebook, poster or display

Division III – Senior Division (4-H age 14-18)

***Class 4009 Computer program**, application, app, script, or coded system that is new and unique (not merely a file run in a program, such as a 'word document' or a picture drawn in 'Microsoft Paint.')

***Class 4010 Coded Website-** built entirely by the 4-H Member (not using a pre-made template generator such as Wix or Square Space). Items in this class could be coded in HTML, CSS, Javascript, Wordpress, or other web-based programming languages or platforms.

***Class 4011 Microcontroller or Microcomputer Application-** a small circuit board that is programmed to accomplish a specific task (projects built and programmed using Raspberry Pi, Arduino, etc.)

***Class 4012 Educational Exhibit** a notebook, poster or display

ELECTRIC AND RENEWABLE ENERGY

Through the Electric/Electronics or Small Engines, you will have the opportunity to educate others about what youth have learned through the project or to promote the benefits of participation in those project areas.

Rules

1. Each Electronics & Renewable Energy Exhibit must include a "4-H Electronics & Renewable Energy Information Form" which is available through your local K-State Research and Extension Office or at http://electric.engtech4ks.com/ . This form must be attached to the outside of a 10" x 13" manila envelope. Youth must also include a wiring diagram or schematic. Place them inside the manila envelope. For notebooks, display boards, and posters, no additional exhibit information is required; no manila envelope is needed for these exhibits.
2. Items that have been in use should be cleaned for exhibit.
3. A sheet of operating instructions must be furnished and included in the manila envelope for any exhibit not self-explanatory.
4. Projects must be operable using only 110 or 120V AC or battery power. If battery power is required, batteries must be furnished.
5. Any project with a complexity of size or electronics must have (a) instructions for assembly and use and (b) equipment available at the time of judging for actual testing of the exhibit.
6. No hand dipped solder may be used on exhibits.
7. If a safety violation is noted by the judges, superintendent, or other staff, the exhibitor's exhibit, at the judges' discretion, will receive a participation ribbon.

Scoresheets, Forms, and Contest Study Materials:

- Electric Scorecards
- Project Area – Electricity/Electronics
- Project Area – National Curriculum Renewable Energy (Power of Wind)

Classes

Section A – Electrical and Electronics

***Class 3501 AC Electric Projects**. Electric projects with a 110 or 120 V alternating current (AC) power source. Some project examples are household wiring demonstrations, small appliances, extension cords, trouble lights, indoor or outdoor wiring boards, or shop lights. Projects may be a restoration or original construction. The project must be operational and meet minimum safety standards. AC projects must be 110/120V, no 240V exhibits are allowed, and must be constructed such that the judge has wiring access to examine the quality and safety of workmanship.

***Class 3502 DC Electric Project.** Electric projects with a battery or direct current power source. This class includes electric kits or original projects. This class also includes demonstration DC powered projects. Examples include: wiring two or three way switches, difference between series/parallel lighting circuits or wiring doorbells switches. All DC electric projects must include batteries supplied by 4-H'er. Projects must be constructed such that the judge has access to examine the quality of wiring workmanship.

***Class 3503 Electronic Projects**. Electronic projects with a battery or direct current power source. This class includes electronic kits or original projects. Examples include radios, telephones, toy robots, light meters, security systems, etc. May be constructed using printed circuit board, wire wrap, or breadboard techniques. Include instruction/assembly manual if from a kit. Include plans if an original project. Projects must be constructed such that the judge has access to examine the quality of wiring workmanship.

***Class 3503 Newly Built or Repaired Computers**. This class id for newly built or repaired computers (laptop or PC) and allows 4-H members to demonstrate skills integrating the various parts of a computer into a single unit. Displays should show either a fully functional computer or show what the individual components do. The display should be free of dust and cabled neatly.

***Class 3505 Educational Displays and Exhibits**. The purpose of the educational display and exhibit is to educate the viewer about a specific area of the 4-H electrical or electronics project. The display or exhibit should illustrate one basic idea. This class includes any educational displays, exhibits or science fair projects which DO NOT have a power source, i.e. exhibits, posters or displays or wire types, conduit types, electrical safety, tool or motor parts identification or electrical terminology. Educational displays and exhibits must be legible from a distance of four feet using a maximum tri-fold size of 3' x 4'.

Section B – Alternative Energy - A form of energy derived from a natural source, such as the sun, geothermal, wind, tides or waves. All exhibits in this division are limited in size to standard, tri-fold, display boards (36" X 48") and items may not extend beyond 12" from the back board. All displays must be self-standing.

***Class 3506 Education Display** - Create an exhibit that addresses a focused topic related to power generated from a renewable energy source. The purpose of the exhibit is to inform and create awareness.

***Class 3507 Experiment** – Display an experiment addressing a problem or question related to power generated from a renewable energy source. Include hypothesis, background research, variables, a control, data, findings, conclusions and recommendations for future study.

ROBOTICS

The Kansas 4-H Robotics program is designed to allow 4-H members to explore robotics through robots of various designs.

Rules

1. Each exhibit must include a robot, information packets are not a sufficient exhibit.
2. Robots must have automated articulated structures (arms, wheels, grippers, pneumatic, hydraulic, etc.). Game consoles that display on a screen are not considered robots and should either be entered in the Computer Sciences division or Electronics and Renewable Energy project. Robots requiring no assembly, just programming, such as Ozobots, are considered Computer Science projects as the skill is focused on the programming not on the construction of the robot.
3. Robot dimensions should not exceed 2 feet high, by 2 feet wide, by 2 feet deep. If displayed in a case (not required, but highly encouraged), the outside case dimensions should not be excessive. The display case should have the exhibitor's information attached to both the lid and the cover, as the top part of the case may be separated from the display.
4. Materials including but not limited to obstacles, spare batteries, and mats for testing the robot may be placed in a separate container, which is not included in the robots' dimensions, that container may not be larger than 576 cubic inches as measured along the outside of the container (Examples: 4" x 4" x 36" or 4" x 8" x 18" or 6" x 6" x 16"). The container, if used, and/or any large objects (such as mats or obstacles) should be labeled with the exhibitor's name(s) and club as they will be stored separately from the exhibit.
5. All electric components of the robot must be adequately covered or concealed with a protective enclosure. Paper is NOT considered an adequate enclosure or covering for electrical components.
6. Robots may be powered by an electrical, battery, water, air, or solar source only. Junk drawer robots may be powered by a non-traditional power source. Robots powered by fossil fuels/flammable liquids will be disqualified. Robots that include weaponry of any kind will be disqualified. Weaponry is defined as any instrument, possession, or creation, physical and/or electrical that is intended to inflict damage and/or harm to individuals, animal life, and/or property.
7. ***Remote controlled robots*** are allowed under certain conditions provided that the robot is *not drivable*. Robots programmed on phones/tablets need to have a specific program created, using motion controls to move the robot are not acceptable, for example "press forward on the screen to make the robot go forward." Robotic arms (hydraulic or electric) are allowed. A remote is allowed, provided more than a single action happens when a single button is pressed on the remote, for example "a motor spins for 3 seconds, at which point an actuator is triggered, then the motor spins for 3 more seconds." Remote controlled cars, boats, planes and/or action figures, etc. are not allowed.
8. Each robot must be in working condition. The judges will operate each robot to evaluate its workmanship and its ability to complete its intended task. In the event the robot uses a phone, tablet, or similar device for both programming AND control of the robot, the robot will need to be fully operated at consultation judging.
9. Each exhibitor is required to complete the "4-H Robotics Exhibit Information Form" which is available through your local K-State Research and Extension office or at http://robotics.engtech4ks.com/
10. This form must be attached to the outside of a 10" x 13" manila envelope. All revisions of all forms previously released for the Engineering & Technology division either undated or dated prior to current year are void for use and new forms must be obtained and used that are dated by the State 4-H Office for the current year. Use of old forms should result in the loss of one ribbon placing for exhibits.
11. The exhibit must include written instructions for operation (the instructions should be written as if they were to tell a grandparent or elderly person how to operate the robot), construction plans (do not need to be printed), a video, and one to five pages of project photographs. For robots that can be programmed, robot programming information must be included, this information should be placed inside the 10" x 13" manila envelope mentioned above. Robot programming information can be, but not limited to, source code, block diagrams, screen captures of the coding window, and other images that show the programming logic used. The exhibitor may enter their Robotics project listed under the Electric and Renewable Energy project if the exhibitor so chooses.
12. Creativity, workmanship, and functionality will be strong criteria in judging the "Robot designed by Exhibitor" classes. All robots should have a purpose or intended function, examples include, but are

not limited to following a line, sweeping the floor, solving a Rubix Cube, sorting colors, or climbing stairs.

13. Exhibitor's name(s) and club must be tagged or labeled on the robot such as on the bottom of the robot, exhibit cards are not an acceptable form of labeling.
14. To form a Kansas 4-H Engineering and Technology-Robotics team, each team member must be currently enrolled in the Kansas 4-H Engineering & Technology project.

Additional Resources:

- http://robotics.engtech4ks.com/
- Robotics Scoresheet
- Robotics Exhibit Form

Classes

Division I – Beginner Division Ages 7 to 8 -

Class 4101 Robot made from a commercial (purchased) kit (No programming just assembly)

Class 4102 Robot designed and constructed by exhibitor. The robot must not be a mere modification of an existing robot kit or plan.

Class 4103 Programmable robot made from a commercial (purchased) kit.

Class 4104 Robot designed and constructed by exhibitor or from a commercial kit that is operated by a remote-controlled device.

Class 4105 Junk Drawer Robotics

Class 4106 Educational Exhibit a notebook, poster or display

Division II - Intermediate Division Ages 9 to 13

***Class 4107 Robot made from a commercial (purchased) kit** (No programming just assembly)

***Class 4108 Robot designed by exhibitor.** The robot must not be a mere modification of an existing robot kit or plan.

***Class 4109 Programmable robot made from a commercial (purchased) kit.**

***Class 4110 Robot designed and constructed by exhibitor or from a commercial kit** that is operated by a remote-controlled device.

***Class 4111 Junk Drawer Robotics**

***Class 4112 Educational Exhibit** a notebook, poster or display

Division III - Senior Division Ages 14 and 18

***Class 4113 Robot made from a commercial (purchased) kit** (No programming just assembly)

***Class 4114 Robot designed by exhibitor.** The robot must not be a mere modification of an existing robot kit or plan.

***Class 4115 Programmable robot made from a commercial (purchased) kit.**

***Class 4116 Robot designed and constructed by exhibitor or from a commercial kit** that is operated by a remote-controlled device.

***Class 4117 Junk Drawer Robotics**

***Class 4118 Educational Exhibit** a notebook, poster or display

Division IV – Team Robotics Project

***Class 4119 Robot designed and constructed by two or more 4-H Stem project members.** The robot must not be a mere modification of an existing robot kit or plan. The robot may be a programmable type that is made from a commercial (purchased) kit. This division is designed to encourage teamwork and cooperation among fellow 4-H Stem members. As with many high tech projects today, no one person designs and builds a robot alone. It takes the brainstorming, planning, problem solving, and cooperation of an entire team to complete a given robotics project.

***Class 4120 Educational Exhibit** a notebook, poster or display

SMALL ENGINES

Through Small Engines, you will have the opportunity to educate others about what youth have learned through the project or to promote the benefits of participation in those project areas.

All exhibits should involve engines smaller than 20 horsepower. Engine should contain no fuel in tank or carburetor. Displays are limited to 4' wide and 4' deep - both upright and floor displays.

Rules

1. Each Small Engines exhibit must include a "4-H Small Engines Information Form," which is available through your local K-State Research and Extension Office or at http://smallengines/engtechrks.com/ . This form must be attached to the outside of a 10" x 13" manilla envelope.Place them inside the manilla envelope. For notebooks, display boards, and posters, no additional exhibit information is required; no manilla envelope is needed for these exhibits.
2. Items that have been in use should be cleaned for exhibit.
3. A sheet of operating instructions must be included in the packet for any exhibit that is not self-explanatory.

CLASSES

***Class 4201 Display** - Exhibit a display, selecting 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 special tools needed for small engine work; OR 3) a display illustrating and providing the results of any one of experiments that are included in the project books. No complete engines, lawn tractors, tillers, chainsaws are permitted for display. Maximum tri-fold size is 3' x 4'.

***Class 4202 Maintenance** - Exhibit a display that illustrates either 1) Routine maintenance procedures OR 2) Diagnosing and troubleshooting specific problems in an engine. No complete engines, lawn tractors, tillers, chainsaws, etc. are permitted for display, using a maximum tri-fold size of 3' x 4'.

***Class 4203 Operation** - Exhibit an operable small engine (no more than 20 HP) overhauled or rebuilt by the member. Include maintenance schedule for the engine and a brief description of steps taken by the member overhauling or rebuilding the engine. Engine should contain no fuel in tank or carburetor.

Project Area

- Small Engines
- Small Engine Scoresheet

UNCREWED AERIAL SYSTEM

The 4-H uncrewed aerial system or UAS project explores the world from above the trees and discovers new frontiers with UASs. UASs are commonly known as Uncrewed Aerial Vehicles (UAVs) or drones. Members explore the uses and applications of uncrewed aerial system including how UASs link to other projects such as geology, robotics, electronics, crop science and many more.

Rules

1. The information that accompanies the UAS must be limited to the 4-H Engineering and Technology Exhibit Information Form which is affixed to a 10" x 13" envelope. This envelope should NOT be attached to the UAS. This may be downloaded from http://uas.engtech4ks.com/. Any UAS exhibit not including this completed envelope will receive an automatic participation ribbon. All revisions of forms previously released for the division dated prior to current year are void for use and new forms must be obtained and used that are dated by the Extension Office for the current year.
2. Exhibitor's name, club, age, and years(s) in project must be tagged or labeled on the exhibit, educational display, notebook, and/or poster.
3. Uncrewed Aerial System that include or depict weaponry of any kind will be disqualified.
4. For scratch built UAS kits, if modifications are made to the exhibit, a page should be attached noting those modifications.
5. If a safety violation is noted by the judges, superintendent, or other staff, the exhibitor's exhibit, at the judges' discretion, will receive a participation ribbon.
6. For practical application entries, the UAS is not required to be displayed as part of the exhibit, only the supporting material.
7. The same UAS may be used by multiple exhibitors for different practical application entries.

Scoresheets, Forms, and Contest Study Materials:

- http://uas.engtech4ks.com/
- UAS Judging Sheet
- UAS Exhibit Form

Classes

Division I – Junior Division (4-H age 7-8)

Class 4301 Unmanned Aerial System designed and constructed by exhibitor that is operated by a remote controlled device. The UAS must not be a mere modification of an existing kit or plan. You may not exhibit a UAS that is purchased off the shelf in this class.

Class 4302 Practical application of an Unmanned Aerial System constructed from a commercial (purchased) kit. This includes the UAS, plus one or more of the following: video, notebook, poster, display board, etc. This class is separate from educational exhibits. A tangible use would be mapping Russian olive trees, eroded soils, and bindweed in fields, etc. There are also many other non-agricultural UAS uses that would be appropriate for this class.

Class 4303 Educational Exhibit a notebook, poster or display

Division II – Intermediate Division (4-H age 9-13)

***Class 4304 Unmanned Aerial System designed and constructed by exhibitor** that is operated by a remote controlled device. The UAS must not be a mere modification of an existing kit or plan. You may not exhibit a UAS that is purchased off the shelf in this class.

***Class 4305 Practical application of an Unmanned Aerial System constructed from a commercial (purchased) kit.** This includes the UAS, plus one or more of the following: video, notebook, poster, display board, etc. This class is separate from educational exhibits. A tangible use would be mapping Russian olive trees, eroded soils, and bindweed in fields, etc. There are also many other non-agricultural UAS uses that would be appropriate for this class.

***Class 4306 Educational Exhibit** a notebook, poster or display

Division II – Senior Division (4-H age 14-18)

***Class 4307 Unmanned Aerial System designed and constructed by exhibitor** that is operated by a remote controlled device. The UAS must not be a mere modification of an existing kit or plan. You may not exhibit a UAS that is purchased off the shelf in this class.

***Class 4308 Practical application of an Unmanned Aerial System constructed from a commercial (purchased) kit**. This includes the UAS, plus one or more of the following: video, notebook, poster, display board, etc. This class is separate from educational exhibits. A tangible use would be mapping Russian olive trees, eroded soils, and bindweed in fields, etc. There are also many other non-agricultural UAS uses that would be appropriate for this class.

***Class 4309 Educational Exhibit** a notebook, poster or display