Engineering is a systematic and iterative approach to addressing human needs and wants, by designing, building, and testing tools, processes, and systems. Through engineering projects, youth learn about the iterative engineering design process, attributes of design, impacts of systems, and effects of technology on the environment.

- Identify and define a problem, its constraints, and goals/criteria a solution must meet
- Develop possible solutions; test and optimize the design solution.
- Engage in engineering practices: defining problems, using models, carrying out investigations, analyzing/interpreting data, using math, designing solutions, engaging in argument from evidence, and communicating information.

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<th>Starting Out</th>
<th>Learning More</th>
<th>Exploring Depth</th>
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<td><em>Beginner</em></td>
<td><em>Intermediate</em></td>
<td><em>Advanced</em></td>
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<tr>
<td>- Experience the engineering design process.</td>
<td>- Learn about engineering fields and careers.</td>
<td>- Identify real-life issues and their constraints and design a tool to help solve the issue.</td>
</tr>
<tr>
<td>- Record designs and testing in an engineering notebook.</td>
<td>- Make connections between human issues and how engineering can help provide solutions.</td>
<td>- Explore engineering in context of disciplines: agriculture, energy, medical, and others.</td>
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<tr>
<td>- Learn about the types and safety considerations of tools and equipment.</td>
<td>- Start to think about systems thinking and how individual parts of a system work together.</td>
<td>- Explore the interactions of technology (created using engineering) and their effects on the world.</td>
</tr>
<tr>
<td>- Learn about form and function and the role of materials in engineering design.</td>
<td>- Learn about the selection, development, and use of tools.</td>
<td>- Dig deeper into ethics, equity, and responsibility of engineers.</td>
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<tr>
<td>- Evaluate design solutions against relevant criteria.</td>
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</table>

The activities above are ideas to inspire further project development. This is not a complete list.
Expand Your Experiences!

Science, Technology, Engineering, and Mathematics

- Go on a field trip of an engineering company or organization.
- Build your own measurement tool in order to conduct a scientific investigation.
- Research and discuss with other members the relationship between science and engineering—how are they different? How are they similar?

Healthy Living

- Learn about the safety of a tool or equipment and present to the other project members.
- Identify a health-related need in your home or community and then design, build, and test a device that can help meet that need.
- Learn about the engineering behind a piece of medical equipment.

Citizenship

- Select one tool and trace its lineage. When was that tool first introduced? Who created it and for what purpose? What effect has adoption of that tool had on society?
- Identify a community need and then plan and implement a service learning project to address that need using the experience you’ve gained in this project.

Leadership

- Serve as a Junior or Teen Leader for the Engineering project.
- Lead an engineering activity at a 4-H club meeting for younger members.
- Serve as the lead for a service learning project related to engineering, form a group of fellow members, and submit a request for funding.

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<th>Connections &amp; Events</th>
<th>Curriculum</th>
<th>4-H Record Book</th>
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<tr>
<td>Presentation Days – Share what you’ve learned with others through a presentation.</td>
<td>4-H Robotics: Engineering for Today and Tomorrow <a href="http://www.4-h.org/robotics">www.4-h.org/robotics</a></td>
<td>4-H Record Books give members an opportunity to record events and reflect on their experiences. For each project, members document their experiences, learning and development.</td>
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<tr>
<td>Field Days – At these events, 4-H members may participate in a variety of contests related to their project area.</td>
<td>TechXcite: Discover Engineering <a href="http://techxcite.pratt.duke.edu">techxcite.pratt.duke.edu</a></td>
<td>4-H Record Books also teach members record management skills and encourage them to set goals and develop a plan to meet those goals.</td>
</tr>
<tr>
<td>Contact your UC Cooperative Extension Office to determine additional opportunities available, such as a field day.</td>
<td>4-H The Power of the Wind <a href="http://www.4-h.org/curriculum/wind">www.4-h.org/curriculum/wind</a></td>
<td>To access the 4-H Record Book online, visit <a href="http://ucanr.edu/orb">http://ucanr.edu/orb</a></td>
</tr>
<tr>
<td>Exploratorium, the Tinkering Studio projects <a href="http://tinkering.exploratorium.edu">tinkering.exploratorium.edu</a></td>
<td>Design It! <a href="http://npass2.edc.org/resources/design-it">npass2.edc.org/resources/design-it</a></td>
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University of California Agriculture and Natural Resources

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