

# SCOUTMASTER BUCKY

## Engineering Merit Badge

2024 Edition



### Expectations

- Active interaction/participation is expected and mandatory.
- Share in your own words – avoid reading your answers.
- Pay attention to the action verbs.
- Bring proof of completion (even partially completed work)



### Things to Remember to Bring

1. Your BSA ID# and / or your Merit Badge Blue Card properly filled out and signed off by your Scout Leader
2. Engineering Merit Badge Pamphlet
3. Scout Uniform
4. Supporting documentation or project work pertinent to this merit badge which may also include a Merit Badge Workbook for reference with notes.
5. A positive Scouting focus and attitude





# SCOUTMASTER BUCKY

## Engineering Merit Badge

### Requirements Insights

Req	Expectation(s)
1	<b>You will be able to successfully complete this requirement during the class if you have prepared ahead of time.</b> <ul style="list-style-type: none"> <li>• Time will be allotted for those Scouts who have prepared for to share their work for sign off consideration.</li> </ul>
2	<b>You will be able to successfully complete this requirement during the class if you have prepared ahead of time.</b> <ul style="list-style-type: none"> <li>• Review this requirement ahead of time to help formulate how you will answer during class discussion.</li> </ul>
3	<ul style="list-style-type: none"> <li>• While this requirement will be completed during the class, Scouts are encouraged to prepare ahead of time to ensure sign off on this requirement during the class.</li> </ul>
4	<ul style="list-style-type: none"> <li>• This requirement will be completed during the class.</li> </ul>
5	<ul style="list-style-type: none"> <li>• This requirement will be completed during the class.</li> </ul>
6	<b>You will be able to successfully complete this requirement during the class if you have prepared ahead of time.</b> <ul style="list-style-type: none"> <li>• Time will be allotted for those Scouts who have prepared to share their work for sign off consideration.</li> </ul>
7	<ul style="list-style-type: none"> <li>• This requirement will be completed during the class.</li> </ul>
8	<ul style="list-style-type: none"> <li>• This requirement will be completed during the class.</li> </ul>
9	<b>You will be able to successfully complete this requirement during the class if you have prepared ahead of time.</b> <ul style="list-style-type: none"> <li>• Time will be allotted for those Scouts who have prepared to share their work for sign off consideration.</li> </ul>

**Merit Badge Workbooks are a tool to aid Scouts with their work preparation. BSA discourages — but does not ban — the use of any merit badge worksheets or workbooks. Merit badge counselors must NEVER require the use of merit badge worksheets or workbooks and may if they choose, refuse to accept them. Scouts shall not be required to use ANY of these to complete a merit badge.**





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## Engineering Merit Badge

### ENGINEERING MERIT BADGE WORKBOOK

**REQUIREMENT 1:** Select a manufactured item in your home (such as a toy or an appliance) and, under adult supervision and with the approval of your counselor, investigate how and why it works as it does.

**Selected Item:**

\_\_\_\_\_  
Counselor's Name

\_\_\_\_\_  
Phone

\_\_\_\_\_  
Counselor's Signature

\_\_\_\_\_  
Date

☐

*approved*

**Notes:**



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## Engineering Merit Badge

**REQUIREMENT 1:** Find out what sort of engineering activities were needed to create it.

Notes:

**REQUIREMENT 1:** Discuss with your counselor what you learned and how you got the information.

Notes:

**REQUIREMENT 2:** Select an engineering achievement that has had a major impact on society. Using resources such as the internet (with your parent or guardian's permission), books, and magazines, find out about the engineers who made this engineering feat possible, the special obstacles they had to overcome, and how this achievement has influenced the world today. Tell your counselor what you learned.

**Selected Engineering Achievement:**

\_\_\_\_\_  
Parent or Guardian's Name

\_\_\_\_\_  
Phone

\_\_\_\_\_  
Parent or Guardian's Signature

\_\_\_\_\_  
Date



*approved*



# SCOUTMASTER BUCKY

## Engineering Merit Badge

**Engineers:**

**Obstacles:**

**Influence Today:**



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**REQUIREMENT 3:** Explain the work of six types of engineers. Pick two of the six and explain how their work is related.

Engineer Type #1:

What they do:

Engineer Type #2:

What they do:

Engineer Type #3:

What they do:



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**Engineer Type #4:**

**What they do:**

**Engineer Type #5:**

**What they do:**

**Engineer Type #6:**

**What they do:**



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Selected Engineer Type #1:

Selected Engineer Type #2:

How these two types of engineers' work is related:





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## Engineering Merit Badge

**REQUIREMENT 4:** Visit with an engineer (who may be your counselor or parent) and do the following.

Engineer's Name:

Type of Engineer:

Date and Location of visit:

**REQUIREMENT 4a:** Discuss the work this engineer does and the tools the engineer uses.

Notes:

**REQUIREMENT 4b:** Discuss with the engineer a current project and the engineer's particular role in it.

Notes:

**REQUIREMENT 4c:** Find out how the engineer's work is done and how results are achieved.

Notes:



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## Engineering Merit Badge

**REQUIREMENT 4d:** Ask to see the reports that the engineer writes concerning the project.

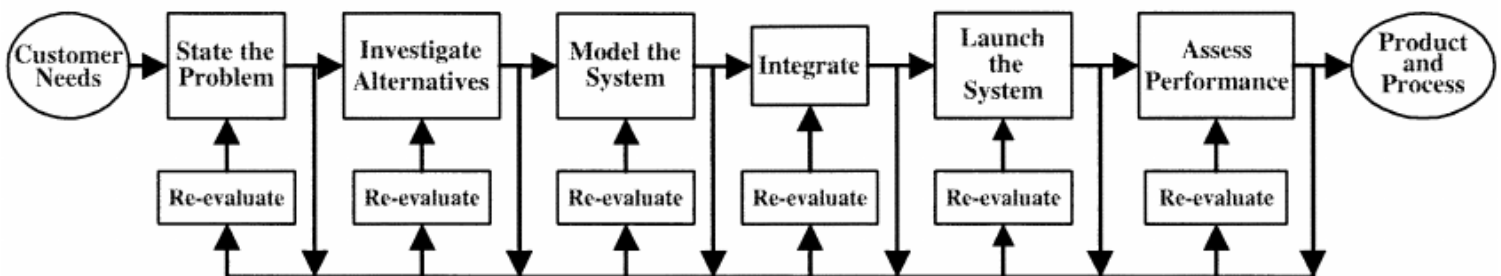
Notes:

**REQUIREMENT 4e:** Discuss with your counselor what you learned about engineering from this visit.

Notes:

**REQUIREMENT 5:** Use the systems engineering approach to design an original piece of patrol equipment, a toy or a useful device for the home, office, or garage.

### The Systems Engineering Process



State the Problem:



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**Investigate Alternatives:**

**Model the System:**

**Integrate:**

**Launch the System:**

**Assess Performance:**



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**DO TWO OF THE FOLLOWING (6A, 6B, 6C, 6D, 6E, 6F, or 6G) FOR REQUIREMENT 6**

**REQUIREMENT 6a:** *Transforming motion.* Using common materials or a construction set, make a simple model that will demonstrate motion.

Be sure to review the merit badge pamphlet for preparation information on this requirement.

**This requirement must be reviewed with your merit badge counselor.**

Be sure to bring any work you have done in preparation to share with your merit badge counselor.

**REQUIREMENT 6a:** *Transforming motion.* Explain how the model uses basic mechanical elements like levers and inclined planes to demonstrate motion.

**Notes:**

**REQUIREMENT 6a:** *Transforming motion.* Describe an example where this mechanism is used in a real product.

**Notes:**



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**REQUIREMENT 6b:** *Using electricity.* Make a list of 10 electrical appliances in your home. Find out approximately how much electricity each uses in one month.

Electrical Appliance #1:	Electricity Used in a Month
Electrical Appliance #2:	Electricity Used in a Month
Electrical Appliance #3:	Electricity Used in a Month
Electrical Appliance #4:	Electricity Used in a Month
Electrical Appliance #5:	Electricity Used in a Month
Electrical Appliance #6:	Electricity Used in a Month
Electrical Appliance #7:	Electricity Used in a Month
Electrical Appliance #8:	Electricity Used in a Month
Electrical Appliance #9:	Electricity Used in a Month
Electrical Appliance #10:	Electricity Used in a Month

**REQUIREMENT 6b:** *Using electricity.* Learn how to find out the amount and cost of electricity used in your home during periods of light and heavy use.

**Notes:**



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**REQUIREMENT 6b:** *Using electricity.* List five ways to conserve electricity.

Electricity Conservation #1:

Electricity Conservation #2:

Electricity Conservation #3:

Electricity Conservation #4:

Electricity Conservation #5:



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**REQUIREMENT 6c:** *Understanding electronics.* Using an electronic device such as a smartphone or tablet computer, find out how sound, video, text, or images travel from one location to another.

Be sure to review the merit badge pamphlet for preparation information on this requirement.

**This requirement must be reviewed with your merit badge counselor.**

Be sure to bring any work you have done in preparation to share with your merit badge counselor.

**Notes:**

**REQUIREMENT 6c:** *Understanding electronics.* Explain how the device was designed for ease of use, function, and durability.

**Notes:**



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**REQUIREMENT 6d:** *Using materials.* Do experiments to show the differences in strength and heat conductivity in wood, metal, and plastic. Discuss with your counselor what you have learned.

Be sure to review the merit badge pamphlet for preparation information on this requirement.

**This requirement must be reviewed with your merit badge counselor.**

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**Wood:**

**Metal:**

**Plastic:**





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**REQUIREMENT 6e:** *Converting energy.* Do an experiment to show how mechanical, heat, chemical, solar, and/or electrical energy may be converted from one or more types of energy to another. Explain your results.

Be sure to review the merit badge pamphlet for preparation information on this requirement.

**This requirement must be reviewed with your merit badge counselor.**

Be sure to bring any work you have done in preparation to share with your merit badge counselor.

**Mechanical:**

**Heat:**

**Chemical:**

**Solar:**



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Electrical:

**REQUIREMENT 6e:** *Converting energy.* Describe to your counselor what energy is

Notes:

**REQUIREMENT 6e:** *Converting energy.* Describe to your counselor how energy is converted and used in your surroundings.

Notes:



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**REQUIREMENT 6f:** *Moving people.* Find out the different ways people in your community get to work.

Notes:

**REQUIREMENT 6f:** *Moving people.* Make a study of traffic flow (number of vehicles and relative speed) in both heavy and light traffic periods.

Notes:

**REQUIREMENT 6f:** *Moving people.* Discuss with your counselor what might be improved to make it easier for people in your community to get where they need to go.

Notes:



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**REQUIREMENT 6g:** *Building an engineering project.* Enter a project in a science or engineering fair or similar competition. (This requirement may be met by participation on an engineering competition project team.) Discuss with your counselor what your project demonstrates, the kinds of questions visitors to the fair asked you, and how well you were able to answer their questions.

**Science / Engineering Fair:**

**Date and Location of Fair:**

**What Your Project Demonstrates:**

**Questions Asked by Visitors:**

**How Well Were You Able to Answer Visitors' Questions?**



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**REQUIREMENT 7:** Explain what it means to be a registered Professional Engineer (P.E.).

Notes:

**REQUIREMENT 7:** Name the types of engineering work for which registration is most important.

Notes:

**REQUIREMENT 8:** Study the Engineer's Code of Ethics. Explain how it is like the Scout Oath and Scout Law.

<https://www.nspe.org/sites/default/files/resources/pdfs/Ethics/CodeofEthics/NSPECodeofEthicsforEngineers.pdf>

Notes:



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**REQUIREMENT 9:** Find out about three career opportunities in engineering.

Career Opportunity #1:

Career Opportunity #2:

Career Opportunity #3:

**REQUIREMENT 9:** Pick one and research the education, training, and experience required for this profession. Discuss this with your counselor.

Selected Career Opportunity:

Educational Requirements:

Training Requirements:

Experience Requirements:

**REQUIREMENT 9:** Explain why this profession might interest you.

Notes: