Scouting America

Engineering Merit Badge Workbook

SCOUTMASTER BUCKY

Scouts participating in a Scoutmaster Bucky merit badge opportunity, whether online or in person, should consider using the Engineering merit badge pamphlet for discovery and knowledge, along with the class preparation pages for clarifications, insights, and expectations.

https://scoutmasterbucky.com/merit-badges/engineering/engineering-pamphlet.pdf

https://scoutmasterbucky.com/merit-badges/engineering/engineering-cpp.pdf

REQUIREMENT 1 REQUIRES COUNSELOR APPROVAL.

REQUIREMENT 2 REQUIRES PARENT / GUARDIAN PERMISSION.

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 APPROVAL: IS REQUIRED.

Counselor's Name _____ Phone or Email _____

Counselor's Signature _____ Date _____ ☐ *approved*

Notes:

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/GUARDIAN PERMISSION: IS REQUIRED.

Parent's / Guardian's Name _____ Phone or Email _____

Parent's / Guardian's Signature _____ Date _____ ☐ *permission*

Engineers:
Obstacles:
Influence Today:

REQUIREMENT 3:	Explain the work of six types of engineers. Pick two of the six types and explain how their work is related to engineering.
ENGINEER #1:	
Type of Engineer:	
What they do:	
ENGINEER #2:	
Type of Engineer:	
What they do:	
ENGINEER #3:	
Type of Engineer:	
What they do:	

ENGINEER #4:
Type of Engineer:
What they do:
ENGINEER #5:
Type of Engineer:
What they do:
ENGINEER #6:
Type of Engineer:
What they do:

SELECTED ENGINEER #1	SELECTED ENGINEER #1
Type of Engineer:	Type of Engineer:
How these two types of engineers' work is related:	

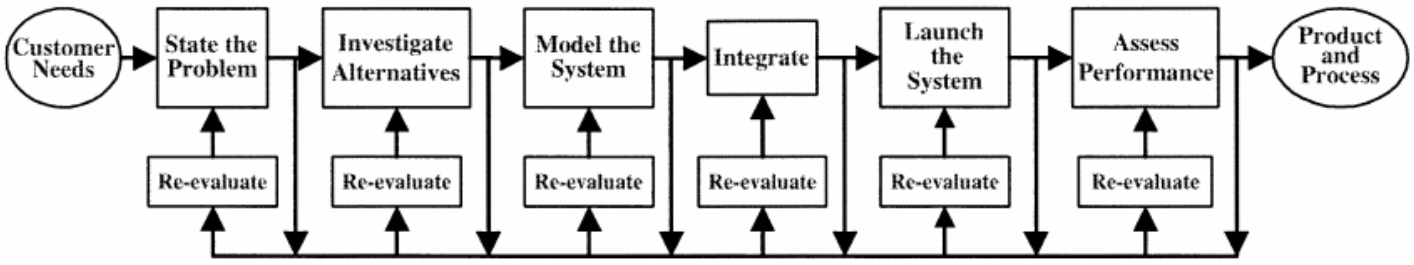
REQUIREMENT 4:	Visit with an engineer (who may be your counselor, parent or guardian) and do the following:
Engineer's Name:	
Type of Engineer:	
Date and Location of Visit:	
REQUIREMENT 4a:	Discuss the work this engineer does and the tools the engineer uses.
Notes:	
REQUIREMENT 4b:	Discuss with the engineer 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:	

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:

Investigate Alternatives:
Model the System:
Integrate:
Launch the System:
Assess Performance:

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 bring any work you have done in preparation to share with your merit badge counselor
Consider using the Engineering Merit Badge Pamphlet for preparation information
This requirement must be reviewed with your merit badge counselor.
BE PREPARED!

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:

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:

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:

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.

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BE PREPARED!

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

Notes:

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.

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BE PREPARED!

Wood:

Metal:

Plastic:

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.

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BE PREPARED!

Mechanical:

Heat:

Chemical:

Solar:
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:

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:	

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:	

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:	

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:	
Education Requirements:	
Training Requirements:	
Experience Requirements:	
REQUIREMENT 9:	Explain why this profession might interest you.
Notes:	