

## **Cradle of Liberty Council STEM Merit Badge College**

**When:** Saturday, September 28, 2019

**Where:** Holy Ghost Preparatory School, 2429 Bristol Pike Bensalem, PA 19020

**Timing:** 8:30am-4:30pm

### Merit Badge Pre-Requisites

Below you will find the pre-requisites for each Merit Badge being offered at the STEM Merit Badge College. In order to complete the badge, these pre-requisites must be completed prior to arriving to each session. If you have any questions about the pre-requisites, please contact Jason Porter ([porter.jason3@gmail.com](mailto:porter.jason3@gmail.com)), Council STEM Committee Chair.

The requirements below apply to all of the Merit Badges.

- Read the Merit Badge pamphlet for each badge you registered for prior to arriving at the session on 9/28/19.
- Print, complete pre-requisites in and bring the worksheet for each Merit Badge/Nova Award for which you registered. Merit Badge/Nova Award worksheets can be found and printed here:  
<http://meritbadge.org/wiki/index.php/Worksheets>

### **AVIATION MERIT BADGE**

Scouts will most likely earn a partial for Aviation Merit Badge on 9/28/19 unless they complete requirement 4 prior to the start of their session.

4. Do ONE of the following:

- a. Visit an airport. After the visit, report on how the facilities are used, how runways are numbered, and how runways are determined to be "active."
- b. Visit a Federal Aviation Administration facility—a control tower, terminal radar control facility, air route traffic control center, or Flight Standards District Office. (Phone directory listings are under U.S. Government Offices, Transportation Department, Federal Aviation Administration. Call in advance.) Report on the operation and your impressions of the facility.
- c. Visit an aviation museum or attend an air show. Report on your impressions of the museum or show.

## **CHEMISTRY MERIT BADGE**

Complete the following in your printed worksheet:

1. Do EACH of the following activities:
  - b. Describe what a safety data sheet (SDS) is and tell why it is used.
  - c. Obtain an SDS for both a paint and an insecticide. Compare and discuss the toxicity, disposal, and safe-handling sections for these two common household products.
6. Do EACH of the following activities:
  - a. Name two government agencies that are responsible for tracking the use of chemicals for commercial or industrial use. Pick one agency and briefly describe its responsibilities to the public and the environment.
7. Do ONE of the following activities:
  - a. Visit a laboratory and talk to a practicing chemist. Ask what the chemist does, and what training and education are needed to work as a chemist.
  - b. Using resources found at the library and in periodicals, books, and the Internet (with your parent's permission), learn about two different kinds of work done by chemists, chemical engineers, chemical technicians, or industrial chemists. For each of the four positions, find out the education and training requirements.
  - c. Visit an industrial plant that makes chemical products or uses chemical processes and describe the processes used. What, if any, pollutants are produced and how they are handled.
  - d. Visit a county farm agency or similar governmental agency and learn how chemistry is used to meet the needs of agriculture in your county.

## **COMPOSITE MATERIALS MERIT BADGE**

Having previously completed Chemistry Merit Badge is preferred, but not required. All requirements of Composite Materials will take place in class.

## **ELECTRICITY MERIT BADGE**

Bring the following materials:

1. Electricity Merit Badge Pamphlet (will be used in class)
2. Compass

Complete the following in your printed worksheet (these are due at the beginning of the class):

2. Complete an electrical home safety inspection of your home, using the checklist found in this pamphlet or one approved by your counselor. Discuss what you find with your counselor.
8. Make a floor plan wiring diagram of the lights, switches, and outlets for a room in your home. Show which fuse or circuit breaker protects each one.
9. Do the following:
  - a. Bring your family's electric bill and be ready to determine the energy cost based on this bill.
  - b. Be prepared to discuss with your counselor five ways in which your family can conserve energy.

## **ELECTRONICS MERIT BADGE**

Bring the following materials:

- Small electronics project kit - <https://www.amazon.com/Vogurtime-Soldering-Educational-Electronic-Practicing/dp/B07K5G97JG>

Prior to 9/28:

Assemble the electronics project kit using a soldering iron under adult supervision and bring it to the merit badge class (attempt to assemble the kit, but if you need help completing it you can get help during the class).

Kit Instructional Manual:

<https://alicliimg.clewm.net/218/401/4401218/15569787509256614af9486cc76b5ae021fd21962cb511556978646.pdf>

## **ENGINEERING MERIT BADGE**

Complete the following in your printed worksheet:

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. Find out what sort of engineering activities were needed to create it. Discuss with your counselor what you learned and how you got the information.
2. Select an engineering achievement that has had a major impact on society. Using resources such as the Internet (with your parent'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.
9. Find out about three career opportunities in engineering. Pick one and research the education, training, and experience required for this profession. Discuss this with your counselor and explain why this profession might interest you.

## **PHOTOGRAPHY MERIT BADGE**

Bring the following equipment:

- Camera

Complete the following in your printed worksheet:

1. Safety. Do the following:
  - b. Show your counselor your current, up-to-date Cyber Chip.
4. Do TWO of the following, then share your work with your counselor.
  - a. Photograph one subject from two different angles or perspectives.
  - b. Photograph one subject from two different light sources—artificial and natural.
  - c. Photograph one subject with two different depth of fields.
  - d. Photograph one subject with two different compositional techniques.
5. Photograph THREE of the following, then share your work your counselor.
  - a. Close-up of a person

- b. Two to three people interacting
- c. Action shot
- d. Animal shot
- e. Nature shot
- f. Picture of a person—candid, posed, or camera aware.

7c. Select 8 to 12 images that best tell your story. Arrange your images in order and mount the prints on a poster board OR create an electronic presentation (put photos on a flash drive). Share your visual story with your counselor.

### **PROGRAMMING MERIT BADGE**

1. Safety. Do the following:
  - a. Show your counselor your current, up-to-date [Cyber Chip](#).

### **OCEANOGRAPHY MERIT BADGE**

Complete the following in your printed worksheet:

1. Name four branches of oceanography. Describe at least five reasons why it is important for people to learn about oceans.
2. Define salinity, temperature, and density, and describe how these important properties of seawater are characterized by the physical oceanographer. Be prepared to discuss the circulation and currents of the ocean. Describe the effects of the oceans on weather and climate.
4. Draw a cross-section of underwater topography. Show what is meant by:
  - a. Continental shelf
  - b. Continental slope
  - c. Abyssal plain
8. Do ONE of the following:
  - a. Write a 500-word report on a book about oceanography approved by your counselor.
  - b. Visit one of the following:
    - i. Oceanographic research ship
    - ii. Oceanographic institute, marine laboratory, or marine aquarium

Write a 500-word report about your visit
  - c. Explain to your troop in a five-minute prepared speech "Why Oceanography is Important" or describe "Career opportunities in Oceanography." (Before making your speech, show your speech outline to your counselor for approval.)

## ROBOTICS MERIT BADGE

Complete the following in your printed worksheet:

1. Safety. Do each of the following:
  - a. Prepare to explain to your counselor the most likely hazards you may encounter while working with robots and what you should do to anticipate, mitigate and prevent, and respond to these hazards. Describe the appropriate safety gear and clothing that should be used when working with robotics.
6. Competitions. Do ONE of the following.
  - a. Attend a robotics competition and report to your counselor what you saw and learned about the competition and how teams are organized and managed.
  - b. Learn about three youth robotics competitions. Tell your counselor about these, including the type of competition, time commitment, age of the participants, and how many teams are involved.
7. Careers. Name three career opportunities in robotics. Pick one and find out the education, training, and experience required for this profession. Discuss this with your counselor and explain why this profession might interest you.

## SPACE EXPLORATION MERIT BADGE

Bring the following equipment:

- 1 - Assembled model rocket (use one of the model rockets kits at this link: <https://www.scoutshop.org/nsearch/?q=rocket> or the equivalent)
- 2 - Class A model rocket engines (<https://estesrockets.com/product-category/engines/>)
- 2 - model rocket engine igniters (<https://estesrockets.com/product/002251-standard-engine-starter-plugs/>)

Complete the following in your printed worksheet:

2. Design a collector's card, with a picture on the front and information on the back, about your favorite space pioneer. Share your card and discuss four other space pioneers with your counselor.

3. At home, build a model rocket. You will launch and recover a model rocket in class on 9/28/19. Be prepared to identify and explain the following rocket parts:
  - a. Body tube
  - b. Engine mount
  - c. Fins
  - d. Igniter
  - e. Launch lug
  - f. Nose cone
  - g. Payload
  - h. Recovery system
  - i. Rocket engine
- 5a. Be prepared to discuss with your counselor a robotic space exploration mission and a historic crewed mission. Tell about each mission's major discoveries, its importance, and what was learned from it about the planets, moons, or regions of space explored.
8. Be prepared to discuss with your counselor two possible careers in space exploration that interest you. Find out the qualifications, education, and preparation required and discuss the major responsibilities of those positions.

## WHOOSH! NOVA AWARD

1.

- Choose A or B or C and complete ALL the requirements.
  - A. Watch about three hours total of engineering-related shows or documentaries that involve motion or motion-inspired technology. Then do the following:
    1. Make a list of at least five questions or ideas from the show(s) you watched.
    2. Discuss two of the questions or ideas with your counselor.

Some examples include—but are not limited to—shows found on PBS ("NOVA"), Discovery Channel, Science Channel, National Geographic Channel, TED Talks (online videos), and the History Channel. You may choose to watch a live performance or movie at a planetarium or science museum instead of watching a media production. You may

watch online productions with your counselor's approval and under your parent's supervision. One example is the NOVA Lever an Obelisk page on ancient Egypt and the use of levers, available at [www.pbs.org/wgbh/nova/egypt/raising/lever.html](http://www.pbs.org/wgbh/nova/egypt/raising/lever.html) .

Examples of magazines include—but are not limited to—Odyssey, Popular Mechanics, Popular Science, Science Illustrated, Discover, Air & Space, Popular Astronomy, Astronomy, Science News, Sky & Telescope, Natural History, Robot, Servo, Nuts and Volts, and Scientific American.

B. Read (about three hours total) about motion or motion-inspired technology. Then do the following:

1. Make a list of at least two questions or ideas from each article.
2. Discuss two of the questions or ideas with your counselor.

C. Do a combination of reading and watching (about three hours total).

Then do the following:

1. Make a list of at least two questions or ideas from each article or show.
2. Discuss two of the questions or ideas with your counselor.
  - Choose ONE merit badge from the following list. (Choose one you have not already used for another Nova award.) After completion, discuss with your counselor how the merit badge you earned uses engineering.

<a href="#">Archery</a>	<a href="#">Engineering</a>	<a href="#">Rifle Shooting</a>
<a href="#">Aviation</a>	<a href="#">Inventing</a>	<a href="#">Robotics</a>
<a href="#">Composite Materials</a>	<a href="#">Mining in Society</a>	<a href="#">Shotgun Shooting</a>
<a href="#">Drafting</a>	<a href="#">Model Design and Building</a>	
<a href="#">Electronics</a>	<a href="#">Railroading</a>	