Teaching the Scouts BSA Engineering Merit Badge with an Optics and Photonics Emphasis

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Abstract: Scouts BSA offers scouts, both boys and girls, the opportunity to earn merit badges. Teaching scouts the Engineering Merit Badge with an optics and photonics emphasis can expose many scouts to a potential optics/photonics career.

1. Merit Badges

1.1. Merit Badges give scouts the opportunity to learn about sports, crafts, science, trades, business, and future careers. Each merit badge has a merit badge pamphlet (I prefer book) that describes the information the scout needs to know, the requirements the scout must complete to earn the badge, and additional resources. The Star Scout rank requires 6 merit badges, the Life Scout rank requires 5 additional merit badges, and the Eagle Scout rank requires 10 additional merit badges (for a total of 21 merit badges). Of the 21 merit badges, 13 merit badges must be chosen from the "Eagle required" list (such as First Aid), but scouts have over 100 other merit badges to choose from to earn the remaining badges. The Engineering merit badge is one such optional, and very popular, merit badge. In 2020, 7,800 scouts earned the Engineering merit badge.

1.2. Engineering Merit Badge Book

The Engineering merit badge book, currently 96 pages, has nine sections: "Introduction", "What Does an Engineer Do?", "The Different Fields of Engineering", "How Does an Engineer Solve Problems", "Basic Engineering Concepts", "Let's Do Engineering", "Engineering as a Career", "The Professional Engineer", and "Engineering Resources". The book contains many engaging pictures, diagrams, charts, tables, and sidebars. An engineering school could consider providing all new students with this book, or write a similar book customized to their specific engineering discipline(s).

1.3. Engineering Merit Badge Book "The Different Fields of Engineering" Section

In the "Different Fields of Engineering" section, the merit badge book describes "The First Engineering Specialties", which includes a description of Civil Engineering, Mining and Metallurgical Engineering, Mechanical Engineering, Chemical Engineering, and Electrical Engineering. The section also describes "Today's Many Fields of Engineering", which includes a description of Aerospace Engineering, Agricultural Engineering, Architectural Engineering, Bioengineering, Ceramic Engineering, Computer Engineering, Environmental Engineering, Industrial Engineering, Manufacturing Engineering, Marine or Naval Engineering, Materials Engineering, Nuclear Engineering, Ocean Engineering, Petroleum Engineering, Software Engineering, and Systems Engineering. But not Optical Engineering or Photonics Engineering. Although Optical Engineering and Photonics Engineering are not specifically mentioned in the book, a merit badge counselor could introduce the scout(s) to the science, technology, and job opportunities of those branches of engineering.

1.4. Engineering Merit Badge Requirement Three

The Engineering merit badge has nine requirements. While discussing the merit badge requirements with the scout(s), a merit badge counselor could include a discussion of optics and photonics, such as requirement three: "Explain the work of six types of engineers. Pick two of the six and explain how their work is related." The merit badge counselor could also include a discussion of the many other branches of engineering necessary for a commercially successful optic or photonic product that is reliable, repeatable, accurate, cost-effective, user-friendly, etc.

Sixteenth Conference on Education and Training in Optics and Photonics: ETOP 2021,
edited by A. Danner, A. Poulin-Girard, N. Wong, Proc. of SPIE Vol. 12297, 122971O
© 2022 SPIE · 0277-786X · doi: 10.1117/12.2635561

1.5. Engineering Merit Badge Requirement Four

Another Engineering merit badge requirement to consider is number four: "Visit with an engineer (who may be your counselor or parent) and do the following: (a) Discuss the work this engineer does and the tools the engineer uses; (b) Discuss with the engineer a current project and the engineer's particular role in it; (c) Find out how the engineer's work is done and how results are achieved; (d) Ask to see the reports that the engineer writes concerning the project; and (e) Discuss with your counselor what you learned about engineering from this visit." The engineer the scouts visits (in person or possibly virtually) could be an Optical or Photonics engineer.

1.6. Engineering Merit Badge Requirement Nine

The Engineering merit badge requirement number nine is career-related: "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." This could be an opportunity to introduce the scout(s) to a career in optics and photonics, and especially how engineers interact with optics technicians.

1.7. Engineering Merit Badge Counselor

Those interested in teaching scouts the Engineering merit badge are encouraged to contact their local scout office. As of this writing, to qualify as a merit badge counselor, you must: (1) Be at least 18 years old and of good character; (2) Be registered with the Boy Scouts of America (position code 42); (3) Complete Youth Protection Training; (4) Be recognized as having the skills and education in the merit badge subjects covered and hold any required qualifications and training as outlined in the Guide to Safe Scouting or the Guide to Advancement – or use others so qualified; and (5) Be able to work with scout-age youth. If you are unsure how to be a merit badge counselor, what's involved, etc., ask your local scout Council if there are scout merit badge training opportunities. One can be a merit badge counselor for a single scout troop, a District, or all scouts. I recommend starting small, but starting.

1.8. Future Optics/Photonics Merit Badge

The author predicts an Optics/Photonics merit badge will be established; however, teaching the Engineering merit badge with an optics and photonics emphasis is a terrific (and possible necessary) intermediate step.