

Engineering Science Portfolios

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The Engineering Science curriculum is designed so that when you graduate with a B.S. degree in Engineering Science, we expect you to have developed the outcomes in the following table (ABET, Accreditation Board for Engineering and Technology, calls these “outcomes”).

ABET ^a	Outcome Description
a	an ability to apply knowledge of mathematics, science, and engineering
b	an ability to design and conduct experiments, as well as to analyze and interpret data
c	an ability to design a system, component, or process to meet desired needs with realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d	an ability to function on multi-disciplinary teams
e	an ability to identify, formulate, and solve engineering problems
f	an understanding of professional and ethical responsibility
g	an ability to communicate effectively
h	the broad education necessary to understand the impact of engineering solutions in a global, economical, environmental, and social context
i	a recognition of the need for, and an ability to engage in life-long learning
j	a knowledge of contemporary issues
k	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

^aThis is the letter used by ABET for each outcome.

Transcripts alone do not demonstrate that you have met all of these outcomes, whereas your portfolio gives you a chance to show how you have met, or exceeded, these expectations. While we strongly encourage you to include *any* evidence that you feel is appropriate for *all* of these outcomes, we feel that it is *essential* that each portfolio demonstrate that you have attained the following five outcomes:

- *an ability to design a system, component, or process to meet desired needs with realistic constraints such as economic, environmental, social, political, ethical, health and safety*
- *an ability to function on multi-disciplinary teams*
- *an understanding of professional and ethical responsibility*
- *a recognition of the need for, and an ability to engage in life-long learning*
- *a knowledge of contemporary issues.*

The purpose of this document is help you assemble your portfolio during your time at Penn State so that you can show that you have achieved these five outcomes. To further assist you and so that you may better organize your portfolio, we will be giving you a three-ring binder with five sections labelled *Design, Multi-Disciplinary Teamwork, Professional & Ethical Responsibility, Life-Long Learning, and Contemporary Issues.**

*Additional dividers for sections will be provided upon request.

Some Examples of the Essential Elements

Ability to Design: Evidence can come from many sources, including, but not limited to, the following courses and experiences:

- EDSGN 100
- design of circuits and devices in E E 210H
- the design project in E SC 416H
- algorithm design in E SC 407H
- the multidisciplinary design project in E SC 497B
- design of a process, algorithm, and/or device in your technical electives
- design of experiments, algorithms, software, processes, products, and/or devices in E SC 410H/411H
- design done as part of internships or co-ops
- extracurricular design (e.g., Rube Goldberg competition, PSU Robotics Club, PSU Society of Automotive Engineers, etc.)

This evidence can be included as, for example, photos, a report or paper, and/or video saved on an optical disc.

Ability of Function on Multi-Disciplinary Teams: Describe courses and activities where you worked in teams, including as part of your senior research and design project. The reflection for this section should demonstrate an understanding of diverse teams consisting of multiple disciplines and multiple degrees of experience (i.e., not just students).

Understanding of Professional & Ethical Responsibility: Include evidence of skills and experiences acquired through courses (activities from EMCH 416H and the E SC 410H/411H seminar will be collected for you), internships, co-ops, workshops, or plant trips. If you are working on the leadership development minor, you should have additional examples.

Some other things to look for:

Sustainability: If you have completed assignments on or worked in the areas of sustainable energy, resources for underdeveloped communities, recycling, etc. you should have several pieces of evidence in this area.

Professional Ethics: Observations of coworkers or supervisors facing ethical dilemmas, classmates violating academic integrity, or standing up others who have behaved unethically.

Recognition of the Need for Life-Long Learning: Include evidence expressing your interest in continuing your education, either part-time while employed in industry or full-time. This can include becoming a member of a professional society,

A Knowledge of Contemporary Issues: Highlight international travel and insights gained about the global community. This can include assignments from courses that cover

diversity and multicultural issues (most courses satisfying the International Cultures requirement could likely be included).

Additional Things to Include

While the above suggestions demonstrate ability for the five *essential* targeted outcomes, your portfolio may also become a personal showcase for additional aspects of your educational growth and development. For example, you might also consider including:

Service: Service activities, including those external to Penn State, should be included.

Teaching Experience: Include evidence from formal programs such as the Teaching Intern program or the Women in Engineering Program Girl Scout presentation, as well as less formal teaching through things like tutoring high school students.

Communication: Written and oral, paper and electronic. Evidence can come from papers written for English courses or class projects, papers published in conference proceedings or journals, articles in the news media or the ESM What's New items, presentations made for courses or at conferences, web sites designed for class or extra curricular groups, etc.

Academic Excellence: Examples of honors, awards, accomplishment in courses, recognition in professional circles, military, or groups external to PSU, Dean's list recognition.

Leadership: Include times you lead a group on a project for a course, during an internship or co-op, and/or during extracurricular activities.

Some General Suggestions

- ✓ We encourage you to put a sticky note on each item as you add them the binder to remind you later why you inserted that item.
- ✓ Once the evidence is gathered in one place, it should be divided into categories with a divider or colored title page for each section. Each section should also contain a reflective summary describing the items included and explaining what each item demonstrates regarding abilities gained with regard to the theme of that section.
- ✓ The front of the portfolio should contain an index of materials, which we encourage you to start early rather than at the end of four years.
- ✓ *After your portfolio is essentially complete*, the first page(s) of the portfolio should be a summary statement assessing how the entire body of the portfolio demonstrates accomplishments with regard to the Engineering Science program outcomes described at the beginning of this document. This statement should also include an overall reflection on your personal and professional development during your time at Penn State.