



Certificate in Engineering Design

Offered at Penn State University Park

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Modern systems and products are increasingly multidisciplinary in nature, and their design requires constant innovation. Graduating students need to be well-equipped for design responsibilities that make their employers more competitive and more productive. Penn State offers the opportunity to enhance students' design skills through the Engineering Design Certificate program, better preparing them for the industry. The program is offered through the School of Engineering Design, Technology, and Professional Programs at the University Park campus.

ABOUT THE CERTIFICATE

The Engineering Design Certificate recognizes the completion of nine additional credits of interdisciplinary design courses and project experiences beyond the required engineering design courses. The certificate emphasizes the application of new design methods and learning new interdisciplinary applications of design, which include design for sustainability, innovative design, integrated product and system design, design for human variability, humanitarian engineering, global design, and affective design. The Engineering Design Certificate particularly recognizes integrated approaches to engineering design that involve the integration of many fields of knowledge, as distinct from the design practices within any single engineering discipline.

CERTIFICATE REQUIREMENTS

- 3 credits of an approved introductory design course (EDSGN 100 or equivalent)
- 9 credits of approved interdisciplinary design projects and courses (3 credits may be for a pre-approved co-op experience in design)
- 1 credit of independent study for the development of portfolios
- Completion of an online and hard-copy professional engineering design portfolio

APPLICATION

Entrance

- Student must be at least 4th semester standing
- Student must be accepted into an engineering major
- Graduate students are eligible to receive certificate

Application

Students wishing to complete the Engineering Design Certificate must prepare an application indicating how they plan to meet the Certificate's requirements. Application must be submitted to the program coordinator. The application can be found on the Web site.

Completion of Requirements

To continue in the program, students must earn a B grade or better in each qualifying course or independent study or pursue a replacement option.

The Nature of Engineering Design

The practice of design has changed over the last three decades, and it is now widely viewed by professionals as a social process with a series of stages that vary somewhat with the nature of the design and the approaches taken by the design teams. For each stage, a variety of tools and methods is available. There are still many who believe in the lone designer who has a bright idea and does a lot of analysis and testing, or the seasoned veteran in industry who keeps doing it until he or she becomes good at it by virtue of experience. The new paradigm embraces both experience and the role of individuals in producing ideas, but design, even innovative design, is now considered teachable and best done in social processes.

The new paradigm applies to the increasingly frequent use of design in interdisciplinary settings and the use of a core set of methods and tools. There are now dozens of textbooks in engineering design that embrace this approach, and many research journals dedicated to advancing core methods and tools in design as well as interdisciplinary design, such as design for the environment/sustainable design, design for human variability, and industrial design. Thus, “engineering design” can be, and increasingly is, used to refer to design that means:

1. The interdisciplinary integration of the ideas, disciplines, people, and resources within engineering and beyond in a defined social design process that develops solutions for products, systems, processes, and services.
2. A design process that follows the definition of engineering design in ABET Criterion 3c; “an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.” So, in application, the design process is interdisciplinary in context.
3. A set of tools and methods that have application to design in most engineering disciplines, which means teaching design as process and treating content as a variable.

The Need for Engineering Design

According to the surveys of recent engineering graduates carried out by the College of Engineering biennially for over a decade, the percentage reporting design, and design related, responsibilities is well over half and growing. Of these trends, specific responsibilities in design are showing the greatest change in responsibility since the first survey. Here are the data for cohorts 1993–2000.

PERCENTAGE OF ALUMNI REPORTING DESIGN AND DESIGN-RELATED RESPONSIBILITIES 1993-2000		
Activity	1993	2000
Solve problems	85%	98%
Work in teams	83%	98%
Computer-aided design	37%	47%
Ensure compliance with codes and standards	53%	69%
Modeling and simulation	22%	42%
Test products or product components	29%	52%
Design products or product components	22%	52%

Research studies have found that companies that do design well are much more successful than the average company. Arguably, students who develop more ability in design may find jobs more easily, in more successful companies, and possibly at a higher pay than they otherwise would. They should also have good productivity skills, and enjoy better lifetime earnings.