

Approaches to Addressing ABET Engineering Design Requirements

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The August 2018 issue of *JOM* offers a set of articles, developed as a project of the TMS Education Committee, that offer useful insights into teaching design in materials science and engineering programs. Sharing practices and experiences in this area is valuable since design in materials science and engineering is different from that in many other engineering disciplines. This can present an issue in ABET accreditation evaluations involving programs from multiple engineering disciplines. (For additional information, please access the white paper at www.tms.org/portal/downloads/profdev/abet/WhitePaperonDesign02252006.PDF that provides clarification and examples of how the ABET engineering design requirement can be achieved.)

Adding to the complexity of the situation, the Engineering Area Delegation of ABET approved changes to criteria 3 and 5 of the

Engineering General Criteria in October 2017. The change that has received the most attention is the revision of the 11 student outcomes (a)-(k) to seven outcomes (1)-(7). In addition, the list of definitions was expanded to include some definitions that were previously in criterion 5 as well as some items that had not been

explicitly defined. One of those changes was an updated and more detailed definition of engineering design (see sidebar). Current information on the criteria can be found at www.abet.org.

The first point of the new engineering design definition is similar to the one previously included in criterion 5. The second point provides a more detailed description of the characteristics of the design process that can provide guidance to programs developing courses to provide design experiences that prepare students for entering the engineering profession. The relative importance of the different factors and the associated details will differ among different types of projects. The third point lists some possible constraints for illustrative purposes.

The August 2018 *JOM* articles that address this topic share design experiences in materials programs at four different institutions and provide examples of different types of projects that can be used to meet the ABET engineering design requirements. This includes projects that involve design of processes, rather than products, but still have defined specifications that need to be addressed. The engagement of industry with the formulation and implementation of projects can introduce real world considerations and a range of constraints. Even research activities, when appropriately framed, can be used to provide engineering design experiences. The examples described in this set of articles will be helpful to programs considering how to best prepare their students for engineering careers.

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ABET Engineering Design Definition

Adopted by ABET in October 2017, the following definition for engineering design will go into effect, beginning with the 2019–2020 evaluation cycle.

- Engineering design is a process of devising a system, component or process to meet desired needs and specifications within constraints. It is an iterative, creative, decision-making process in which the basic sciences, mathematics, and engineering sciences are applied to convert resources into solutions.
- Engineering design involves identifying opportunities, developing requirements, performing analysis and synthesis, generating multiple solutions, evaluating solutions against requirements, considering risks, and making trade-offs for the purpose of obtaining a high-quality solution under the given circumstances.
- For illustrative purposes only, examples of possible constraints include accessibility, aesthetics, codes, constructability, cost, ergonomics, extensibility, functionality, interoperability, legal considerations, maintainability, manufacturability, marketability, policy regulations, schedule, standards, sustainability or usability.