Teaching Engineering, Second Edition

By Phillip C. Wankat and Frank S. Oreovicz
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Reviewed by

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In 1993, Phil Wankat and Frank Oreovicz penned the first edition of *Teaching Engineering*, a project supported by the National Science Foundation and readily available for free download. More than 20 years later, a second edition of this book, now published by the Purdue University Press, is available with updates in virtually every chapter to reflect the changing landscape of engineering education (*e.g.*, a discussion on flipped classrooms). Unfortunately, the free download of this version is not available, but the suggested price point ($65) is more than reasonable for this 17 chapter, two appendix book (approaching 500 pages).

Teaching Engineering begins not with specific content about how to teach engineering, but more of the background story (*e.g.*, demographics on engineering student enrollment, why engineering faculty need to learn about teaching, workshops, etc.) There is also an early chapter on faculty efficiency, including work/life balance. Chapter 3 ("Designing Your First Class") starts the actual content on what would typically be considered teaching engineering, with further chapters on course objectives, problem-solving strategies, teaching via lectures and technology, use of active learning, and laboratory design. The authors also devote a chapter to tutoring/advising, including a discussion of FERPA and counseling. Additionally, there is a chapter on student cheating/ethics, with strategies on how to limit cheating in your course. The end of the book covers ground unfamiliar to most engineering faculty members, such as Myers-Briggs Type Indicators, cognitive developmental theories, and learning theories.

This book is not a page turner, unlike Ken Bain's *What the Best College Teachers Do*. The prose in *Teaching Engineering* is surgical and choppy, often with seemingly the minimum number of required words in a sentence or paragraph to present the concept or information. The book is also a collection of topics, presented in an order that would probably not be the consensus choice for those that read or utilize the book. For example, the chapter on "Efficiency" (Chapter 2) seems better placed towards the end of the book, as would "Designing Your First Class" (Chapter 3). On the other hand, the tools required to help "design your first class" were later in the book (*e.g.*, Objectives, Textbooks, and Accreditation—Chapter 4; Teaching With Technology—Chapter 8; Psychological Type and Learning—Chapter 13).

While the authors' encourage the use of the book for Ph.D. students and, perhaps, in a graduate-level course or workshop on engineering education, it is really a reference book. If you have a question on active learning, grading, laboratories, or learning theories, you can consult the individual chapters that exist on each. All chapters are detailed in their references where a particular piece of information is being presented, almost inviting the reader to explore the topic in more detail in that area on their own.

A notable strength of *Teaching Engineering* is the three chapters towards the end of the book: Psychological Type and Learning (Ch. 13), Models of Cognitive Development (Ch. 14) and Learning Theories (Ch. 15). Engineering faculty are normally standoffish, at best (or dismissive, at worst), when considering what the education literature can tell them about teaching and learning. The argument goes that what is known in the education literature is not transferable to engineering because engineering is inherently different (*e.g.*, it is technical, students perform derivations and solve problems, engineering has lab courses, etc.) However, the authors take great care to distill the aforementioned three chapters into content that becomes much more easily relatable to engineering education (likely aided by the fact that Wankat holds an M.S. degree in education, in addition to his Ph. D. in chemical engineering). For example, there is a discussion on how students at certain developmental levels according to Piaget's theory will have difficulty in engineering, why this is the case and strategies that can be employed to help foster the students' development. Indeed, these three chapters can serve as an engineering faculty member's useful introduction into learning theory.

Finally, while the book is written from the perspective of authors within a chemical engineering department, it is not overly reliant on chemical engineering examples. In fact, the authors make special efforts to bring in applications from many areas of engineering besides chemical engineering. Overall, if you can get past the short sentences and the ordering of the material (and you should), *Teaching Engineering* (2nd Edition) by Wankat and Oreovicz is a book that deserves an easy-to-reach place on the bookshelf of every practicing engineering educator. ❐