Engineering Computation with MATLAB Review
David Smith

REVIEWER INFORMATION

Department: Chemical Engineering   School: The University of Utah

COURSE INFORMATION

Course Title: ChEn 2450 – Numerical Methods for Chemical Engineers   Grade Level: Sophomore

Annual Enrolment: 65

Text In Use: Moler's online text presently. Have used Chapra's text and Hoffman's text in the past

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1. What factors made you chose your current book?

    I don't use a book because students generally haven't found them highly useful. Rather, I have online help resources (wiki page) and I post my lecture notes, screencasts, and example problems. Most students find these resources adequate.

2. How does this book compete with your current text?

    Smith's book focuses heavily on using Matlab, with only cursory and superficial treatment of engineering problem solving (numerical methods). So Smith's book doesn't compete – it more complements what we currently use.

3. Please examine the table of contents of *Engineering Computation with MATLAB* and answer the following:

    a. How does the Table of Contents match with your current course syllabus? Please elaborate.

       My current syllabus focuses on numerical methods applied to engineering problems. Matlab is used as a "tool" and is the means, not the end of the course. There is actually very little intersection between my syllabus and this text.

    b. Would you change the order of chapters? If so, how?

       There are a number of chapters that I think are more useful for computer scientists than for other engineering disciplines, including chapters 6, 7, 9, 16, 17. I would eliminate these in favor of coverage of more applicable topics like solving ODEs, nonlinear equations, and optimization.

    c. Do you, or have you, used this text for more than one course? Please explain.

       No.

2. Please comment on the quality of the book's pedagogy. Are there pedagogical elements in other books you have used that you feel should be incorporated into this text? What are they?

    - I feel that a book covering how to use Matlab is somewhat archaic. Rather, online resources or interactive resources (e.g. Matlab live scripts) can be far more useful from an instructional and expositional standpoint. I have found that students much prefer such resources over a printed text when it comes to learning programming.

3. How well does the author present the material in terms of readability, clarity, etc?

    - Clarity and readability are fine.

4. Which topics in your course present you with the greatest teaching challenge? How does this text handle these topics?

    a. Debugging is consistently the topic that students struggle most with. Their script doesn't work and they struggle to identify why.

    b. Related to the previous point, learning to think algorithmically and separating a problem into manageable pieces that can be addressed (and verified) independently is a challenge.

Debugging is given only a passing mention in the text. Section 10.1 is apparently the only real effort at addressing the second issue (admittedly a challenging one), but falls a bit short.

5. Are there other topics that you would suggest deleting or shortening?
    Chapters 6, 7, 9, 16, 17. As mentioned previously, these are really only very applicable to computer scientists, who receive much better treatment of things like sorting and graph algorithms in their discipline.

6. Are there topics that you would suggest expanding?
    - Problem solving discussions, and engineering-relevant tools including differential equations, nonlinear equations and optimization. Even if these are approached from a "toolkit" approach as with the other numerical methods topics in the book, it would be useful.
    - Section 15.5 should be extended into a discussion of the symbolic toolbox in general. This is a highly valuable, and often overlooked, resource in Matlab.
    - I would also suggest expanding each of the sections in chapter 10 into individual chapters. These constitute the heart of "Engineering Computation" (the title of the text), and far too little emphasis is placed on them.

7. How do you find the quality of the examples? Are there too many or too few?
    adequate

8. Do you find that the problems are sufficient? Do they relate well to the material?
    - The problems are largely focused on relatively mundane applications of the material rather than trying to pull in practical engineering problems that involve the concept at hand. For engineering students, I find that they really appreciate problems that they feel are "real-world" engineering problems.

9. How do you find the quality of the illustrations and photos? Are there too many or too few?
    - The quality is poor, but the quantity is adequate.

10. When considering the adoption of a new edition, what kinds of revisions are most important to you? For example, new problems, new examples, up-to-date references, etc.
    - Added value to the student in terms of pedagogical improvements. Books are expensive and too frequently a new edition appears to serve more to pad pockets of publishers than to improve learning outcomes for students.

11. What supplements do you use in teaching your course? Which would you like to see provided with this text and why? Specifically, are there any particular digital supplements that you would like to see included?
    - I post my lecture notes online, use screencasts of the material covered in class, and have a wiki page that covers some of the basics of Matlab usage for quick reference to the students.
    - I would like to see a significant portion of the text moved to a digital format where live examples are provided (perhaps Matlab live scripts) in a searchable manner.

12. Do you utilize online homework in your course? In your opinion, do you think online grading of programming homework would be a useful tool to accompany this text?

    - All homework is submitted electronically, but is provided in report format with code as supplemental material. Most engineers produce analysis and reports, not software, so I believe that it is of paramount importance to teach them how to use software as a means, not the end. Online grading is tempting, but results in a weaker outcome for students, in my opinion.

13. In your opinion what are the best features of this text?

    - Chapter 3.

Please provide any additional comments you may have below.

- It is my opinion that hard-copy texts covering this type of material will be used less frequently as time progresses. We will be transitioning to more open resources. Publishers would do well to pursue other avenues of funding (perhaps advertising within high-quality, open resources) to deliver content.