

Engineering Computation with MATLAB Review
David Smith

REVIEWER INFORMATION

Department: Mechanical and Aerospace School: Univ. of Texas Arlington

COURSE INFORMATION

Course Title: MAE 2360 Numerical Methods and Computer Programming
Grade Level: sophomore

Annual Enrolment: ~350-390; typically teach one section in spring and fall semesters with semester enrolment of my section between 48 and 74 students

Text in Use: none, currently use a collection of notes with recommended reference texts that are not required

There are two optional references for the course:

- Numerical Methods for Engineers by Steven Chapra and Raymond Canale (any edition)
- Applied Numerical Methods with MATLAB for Engineers and Scientists by S. Chapra, McGraw-Hill (any edition)

I have also recommended the following text for students related to MATLAB

- Essential MATLAB for Engineers and Scientists by Hahn and Valentine – 6th Edition

Further notes: The course I teach is organized in two parts. The first half introduces programming in the C language followed by the second half focusing on implementation of numerical methods while concurrently shifting from C to MATLAB.

This is one of the best books that I have come across so far for MATLAB.

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1. What factors made you chose your current book?

Essential MATLAB for Engineers and Scientists was primarily chosen because the book covered a reasonable number of related topics and was one of the lower price texts.

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

Engineering Computation with MATLAB is better organized concerning the topics covered in the class I teach. Major portions of chapter 1 thought 12 are covered in the second half of the course. The material and order provided is relatively close to the order I choose to present.

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.

As mentioned before, chapters 1 through 12 cover topics that I cover.

1 - Introduction	These three chapters are covered in an introductory lab. I like the organization of the materials as it would supplement my course well.
2 - Getting Started	
3 - Vectors and Arrays	
4 - Execution Control	This is a topic that I cover in comparison to the C language which the students learn in the first half.
5 - Functions	I spend a lot of time emphasizing functions and implementation a variety of algorithms as functions
6 - Character Strings	The majority of character strings a presented in the first half of my course in the C section with formatted I/O. This section could spend more time on fprintf in MATLAB.
7 - Cell Arrays and Structures	I do not cover cell arrays but do introduce structures.
8 - File I/O	File I/O is covered very briefly due to time constraints
9 - Recursion	Recursion is covered in the C part of the course and extended to MATLAB in the function emphasis.
10 - Principles of Problem Solving	This is a good chapter but I cover the material in alternate way

11 – Plotting	This is a very good reference of material that the students are given examples in lab and expected to pick up on their own.
12 – Matrices	Basic linear algebra topics are covered and I find this chapter relevant
15 – Numerical Methods	I cover a much wider variety of numerical methods but this is a decent chapter in the context of this text.
Remaining Chapters	These are beyond what I cover in this course but are relevant for reference. I like that they are included in the text.

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

The chapter order is sufficient. It works and flows well. The plotting chapter is the only chapter that I might change; however, it fits well in the flow. Plotting is a key in my course from the beginning. Therefore, I would likely reference materials from this chapter early on. However, I am not sure if I would actually want a change in the text order.

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

No, I have not used this text before. I was not aware of it before I was asked to review it.

- 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 like the pedagogy of the text. The chapters are well organized. The material flows well. The objectives are clearly stated. The chapters use appropriate graphics, illustrations, exercises and summaries. The style, pitfalls and hits are very useful tools. It would be nice if these were organized into a single document for download from book's website. Furthermore, the summary of commands/operators at the end of chapters is very helpful. The self test provides a way for the student to tell if they are mastering the subject. One particularly useful features is the list of functions in the index. Furthermore, the Special Characters, Reserved Words and Functions tables provides an excellent cross reference for functions and where they are covered.

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

The text is clear and concise. I find it very readable for the student. I like the way some extra material is presented even though it may not be covered in detail. MATLAB is so vast of an environment, you cannot cover all of the tool in a reasonably sized book. Sometimes

providing a list of potential functions or methods related to a particular subject is enough to get the student started exploring online documentation to be able to use that function.

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

I struggle with students that come to the course with no prior programming knowledge. Often, they have not even had experience running command lines on operating systems. This deficiency is handled in the C language section before we get to MATLAB. This text provides an organized manor to learn that material by providing it in a logically progressive order.

5. Are there other topics that you would suggest deleting or shortening?

I don't have any topics that I would suggest deleting. There are parts of the text that I do not cover but I like that they are there for potential reference for future growth.

6. Are there topics that you would suggest expanding?

I would like to see examples that show stepping through the code. I perform a lot of examples in what I call hand execution. I present the variable space and how it changes with each line of code. I don't see this done in many texts but I find it key for the students to grasp what is going on. I would like to see

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

The examples are well organized with well documented code. I don't think more examples would improve the text. Although having additional online examples would be helpful.

8. Do you find that the problems are sufficient? Do they relate well to the material?

The problems are sufficient and relate well to the material. For example, the Execution Control provides good well formatted and documented questions and implementations for each loop technique.

All of the code for the problems and examples should be readily available online for download.

9. How do you find the quality of the illustrations and photos? Are there too many or too few?

The frequency of the illustrations is about right. Many could be updated. (I am not sure if my review copy is the same as the main print version. If it is, I would expect a little better page quality and color images for the price that is asked on sites such as Amazon.com.)

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.

In general, I like to see more up to date references and content. If there is a better way to explain some material then that material could be updated. I definitely do not describe to the notion of producing a new addition just because it has been a certain number of years since the last.

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?

For my course, I provide online lecture notes. Additionally, I provide comparison documents comparing features of MATLAB and the C language. Having access to figures to use on the overhead would be very useful.

This book is lacking in the area of downloadable code. Stepping through the code one line at time provides a powerful learning experience. With new programmers, they are often frustrated with small typographical errors that they cannot catch. Having the code readily available online would provide a tremendous benefit to the student.

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?

I use online submission of the homework but do not use any automatic online grading feature. Having the capability of define problem statements and automatically checking the solution would be very valuable to both the student and myself.

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

I like that it is compact in size yet covers a vast array of features of MATLAB. The Special Characters, Reserved Words and Functions tables is my favorite feature. Providing a summary of like this with cross-reference to the appropriate sections provides a tremendous resource. I think these should be organized into a summary .pdf document that could be downloaded online.

Please provide any additional comments you may have below.

I would like to see the text spend more time on formatted I/O and commands such as `fprintf`. The similarities to C and other languages should be emphasized more.

The text does not cover anonymous functions. This topic should be a short section within chapter 5.

Chapter 2 should include the close command.

Chapter 3 should cover using the colon operator to change an array to a single vector.

Chapter 5 should cover anonymous functions, function handles and handles in general.