CRC
Reviewer Questionnaire

Reviewer 1

Book title: **STEM Problems with Mathcad & Python**

Book author(s): **Valery Ochkov, Alan Stevens, Anton Tikhonov**

Your help in the assessment of this book will greatly assist our editorial decision. All comments will be treated as confidential and any extracts communicated to the author will be anonymous.

SUBJECT, CONTENTS AND AUTHOR

1. Please give your comments on the subject of the proposed book. Is it an important topic for research and/or teaching?

The proposed book would be a very valuable addition to the literature. This is a book on computational problem-solving, which has been a topic of increased importance for both teaching and research.

2. Are the contents well-organised? Please indicate any problems with the structure and suggest ways of solving them.

The contents appear to be well organized. Prof. Ochkov has already written a number of books of this nature.

3. Does the author neglect to include any key material in the book?

No. The authors are very ambitious in their desire to cover a big number of topics and related problems.

4. Should any of the material in the book be omitted?

Not based on the current list of contents.

5. Is the author a recognised authority in this field?

Yes. The authors have (separately) written a number of books. I am aware of Prof. Ochkov's books and Prof. Tikhovov's book on scientific computing with Python (in Russian).

MARKET

6. Is there a real need for this book, and what are the principal markets? Please indicate the level at which the book would appeal and identify the main buyers.

There is absolutely a real need for computational problem-solving books like the one they are proposing. This is a book that explores mathematical problem-solving through computer experimentation. Computing and problem-solving skills are very important not just in academia but also in the industry. In many different STEM fields there is an expectation that their students should be able to solve problems using a computer and in most cases a high-level programming language such as Python, R, and more recently Julia. The book would appeal to college students in the STEM fields, at all levels. College students from different scientific fields and college instructors would be the main buyers.

7. Would this book be suitable for the student market? If so, please identify the relevant courses and level, and indicate whether it would be the main text or supplementary reading.

Yes, this book would be suitable for the student market. It could be used in mathematics, physics, engineering, computer science, and other courses at the college level, possibly even at the high school level for certain problems, either as the main text or supplementary reading. The use of computers and specialized software allows one to gain mathematical insight and intuition that may be difficult to get otherwise.

However, one potential obstacle to wide use of this book by many disciplines could be the use of the Mathcad software, which is not very popular outside of some engineering disciplines. The Python component of the book is what could make it really useful in mathematics, physics and computer science courses. The Mathcad component may appeal only to certain engineering disciplines (excluding electrical engineering). I would certainly want to use the book for my math courses, but only the Python component. We just developed a course on computational problem-solving using Python and R and this could be a great text to use for this course, but the Mathcad component would be a problem when trying to get the Department to approve the book as the main textbook. I really want this book to come into existence because I see great value in it. However, I would recommend to the authors that they replace Mathcad with Python implementations in the book, but keep their Mathcad implementations in an online repository so that they can offer them as an online supplement to mechanical or chemical engineering students who may be interested in Mathcad. This is really the way to greatly expand the readership for this book. I understand that Prof. Ochkov would find this difficult to accept, given that he is an expert in Mathcad and has been probably using it since 1986 when it was released, but the reality is that the future belongs to Python. Thus, making Python the main computing platform would greatly increase the life of this book and I am sure it would bring new editions in the future, but more importantly this would greatly expand the fields where this modern problem book could be used to great benefit. I am sure that the authors can handle this switch to Python and this could really make this book amazingly useful, especially if the authors create Jupyter notebooks hosted on GitHub that contain sample problem solutions and explorations for all other problems for the students, as well as complete problem solutions for instructors only. They can also host on GutHub the Mathcad notebooks that they can offer to engineering students and faculty.

8. What are the principal related/competing titles, and how do they compare with the proposed book? What particular advantages/disadvantages does the proposed book have over them?

a)	The Computer as Crucible: An Introduction to Experimental Mathematics by Jonathan Borwein and Keith Devlin, A K Peters/CRC Press, 2008.
b)	Experimental Mathematics with Maple by Franco Vivaldi, Chapman and Hall/CRC, 2001.
c)	Introduction to Experimental Mathematics by Søren Eilers, Rune Johansen, Cambridge University Press 2017.

There are more books similar to the ones listed above. All of the above books use Maple, which has really been the mathematical software of choice until recently. Our Math Department still has Maple licenses but we stopped using Maple in favor of Python and R. Mathematics and Physics Departments across the US and Canada, and probably Europe, have been using mostly Maple and Mathematica, until recently, but there has been a push to replace them with free, open-source computational software such as Python and R. However, Mathcad has never been a software of choice for math and physics departments. Two of the top reasons for using Python and R, instead of commercial software are the following:

1. Python and R are free and open-source.
2. Python and R are useful even after our students graduate because they are widely used in the industry, Python as a general purpose programming language and R as a statistical programming language. Nobody in the industry uses Maple or Mathematica, which are used mostly for educational purposes.

The proposed book would have a big advantage over the above books and much wider usability if it uses only Python, and leaves Mathcad for online supplements for the mechanical engineering disciplines, being the main users of Mathcad.

CONCLUSION

9. How quickly is the proposed book likely to become out of date?

The only component that would make it out of date quickly is the Mathcad component. The future belongs to Python!

10. Do you think the title is appropriate? Could it be improved?

"Solving STEM Problems with Python" would be better, if they agree to put Mathcad in an online supplement. If they add mathematical art-inspired problems, then they could call it "Solving STEAM Problems with Python".

11. Do you recommend that we publish this book?

Absolutely! Especially, if it's only Python with an online supplement for Mathcad. But even if they don't want to remove the Mathcad component, it would still be a valuable book. Python only would make it much more valuable though.

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Reviewer 2

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SUBJECT, CONTENTS AND AUTHOR

1. Please give your comments on the subject of the proposed book. Is it an important topic for research and/or teaching?

I found the topic of these book an importance topic in STEM education

2. Are the contents well-organised? Please indicate any problems with the structure and suggest ways of solving them.

I am a bit concerned with the Mathcard part of the book. Mathcard seems to be proprietary software, and it might affect the adoption of this book by K12 institutions. I am also a bit concerned with the hybrid component of Mathcard and Python.

3. Does the author neglect to include any key material in the book?

4. Should any of the material in the book be omitted?

Many of the topics seems sophisticated and AP-levels problems, especially the part on ODE and PDE. I am not sure how many high-school students would be confortable with these topics.

5. Is the author a recognised authority in this field?

Yes.

MARKET

6. Is there a real need for this book, and what are the principal markets? Please indicate the level at which the book would appeal and identify the main buyers.

The topic seems to be for undergraduate students in Math and Engineering majors.

7. Would this book be suitable for the student market? If so, please identify the relevant courses and level, and indicate whether it would be the main text or supplementary reading.

The topic seem to be relevant for students from quantitative backgrounds.

8. What are the principal related/competing titles, and how do they compare with the proposed book? What particular advantages/disadvantages does the proposed book have over them?

a)

b)

c)

CONCLUSION

9. How quickly is the proposed book likely to become out of date?

Because Python is a fast-developing, I would expect many of the Python code would need revision in 3 years.

10. Do you think the title is appropriate? Could it be improved?

Yes.

11. Do you recommend that we publish this book?

Yes.

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Reviewer 3

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Your help in the assessment of this book will greatly assist our editorial decision. All comments will be treated as confidential and any extracts communicated to the author will be anonymous.

SUBJECT, CONTENTS AND AUTHOR

1. Please give your comments on the subject of the proposed book. Is it an important topic for research and/or teaching?

In my opinion, the topic of the book is very important from a teaching point of view. It provides a direct relationship between programming and mathematics, what highly contributes to provide a systematic and structural procedure to solve problems.

Since many years ago, programming is becoming a very important tool as support education from a general point of view. It is not just a way to develop software, but it is also a complement to solve problems of other disciplines, such as physics, mathematics, chemistry, etc. In order to use programming correctly, it is important to learn the basis and how to represent, to solve and to visualize the problems to be studied.

Thus, this book contributes to this issue, where STEM problems are represented, solved and visualized using to different programming tools, such as Mathcad and Python. The combination of Mathcad and Python is very useful since it provides two different ways to code the solutions, using symbolic and classical programming structures, respectively.

In summary, I think that the subject of the book is very important for education purposes.

2. Are the contents well-organised? Please indicate any problems with the structure and suggest ways of solving them.

In general, I think that the contests are well-organised. I recommend only to include a list of exercises or open problems to be solved by students in each chapter. This fact would be useful for the book and the audicence.

3. Does the author neglect to include any key material in the book?

I think that the authors have include all the essential material. As I suggested above, I recommend to include exercises and problems to be solved by the readers.

4. Should any of the material in the book be omitted?

No, I think that all the material is good for the book.

5. Is the author a recognised authority in this field?

The authors have a deep experience in the writing of other books related with this topic.

MARKET

6. Is there a real need for this book, and what are the principal markets? Please indicate the level at which the book would appeal and identify the main buyers.

I think that this book can be very useful for high school/University students and teachers, and it could have a good acceptance in the markets.

As mentioned above, nowadays, the use of programming to solve STEM problems is very popular in the education field. So, this book highly contributes to this topic.

7. Would this book be suitable for the student market? If so, please identify the relevant courses and level, and indicate whether it would be the main text or supplementary reading.

In my opinion, the book can be suitable for students at high school and University levels. For high school, the book can be used as support to solve mathematical, physical and mechanics problems using programming. This fact is really useful for students because they can learn to solve problems following a structural procedure.

For University level, the book provides a set of important tools for engineering and science studies that can help students to learn the basis to solve complex problems.

8. What are the principal related/competing titles, and how do they compare with the proposed book? What particular advantages/disadvantages does the proposed book have over them?

The textbooks available in the literature with similar contents were actually written by the same authors of this proposal.

a) Valery Ochkov. 25 Problems for STEM Education. Chapman and Hall/CRC; 1st edition, 2020, 396 p. ISBN 978-0367345259

b) Valery Ochkov, Konstantin Orlov, Volodymyr Voloshchuk. Thermal Engineering Studies with Excel, Mathcad and Internet. Springer, 2016, 466 p., ISBN 978-3319266732.

c) Korobov, Viktor, Ochkov, Valery. Chemical Kinetics with Mathcad and Maple, Springer, 2011, 394 p., ISBN 978-3-7091-0531-3.

d) Solodov, Alexander, Ochkov, Valery. Differential Models. An Introduction with Mathcad, Springer, 2005, 246 p., ISBN 978-3-540-26820-8.

Such as the authors pointed out, the proposed book differs from the previous ones in the combination of Phyton and Mathcad to solve the problems. Moreover, the way to solve the problems is also different, since it shows several ways to find the solution based on the tool used for programming purposes.

CONCLUSION

9. How quickly is the proposed book likely to become out of date?

I think that about 3-4 years.

10. Do you think the title is appropriate? Could it be improved?

Yes, it describes perfectly the contribution of the book.

11. Do you recommend that we publish this book?

Yes, I think that it can be useful for students at high school and University levels.
