Texts for Consultation
Methods of Applied Physics – Spring 2020

As you start to take more advanced Physics courses, it is quite likely you will want to go to sources beyond your textbook, instructor, and classmates to help you out. Getting help from Dr. Google is all well and good, but – as you probably are aware – using internet sources for help has its own dangers and pitfalls.

These are some of the sources I go to when I need a review or need to learn something. Most of these are rather well known texts associated with mathematical methods for physicists. Some commentary is given for each. (The list is just alphabetical by author, so don't assume top-of-the-list books are better).

- Abramowitz, M. and I.A. Stegun (eds) (1964). *Handbook of Mathematical Functions with Formulas, Graphs, and Mathematical Tables* NIST. (Very common reference text. Not really something you'd sit down and read, but worth having on your bookshelf at some point).
- Arfken, G.B, H.J. Weber, and F.E. Harris (2012). *Mathematical Methods for Physicists* (7th Ed.) Academic Press. (Common reference tool; often used in a first year graduate level math physics classes).
- Boas, M.L. (2006). *Mathematical Methods in the Physical Sciences* (3rd Ed.) Wiley. (This text has sometimes been required for this course in the past. It is a very useful reference text if you need a quick refresher on something, and quite readable. Students in recent semesters have disliked it, but I still find this pretty useful.)
- Courant, R. and D. Hilbert (1989). *Methods of Mathematical Physics* (Vols 1 and 2). Wiley-VCH. (If you're looking for academic pedigree, the Hilbert is the Hilbert of "Hilbert space" and Courant is the Courant of the "Courant Institute". Heavy hitters. Less applied than we want to be in this class, however, and at a graduate level).
- *CRC Standard Mathematical Tables* (Published yearly). CRC Press. (Back before there was http://www.integrals.com or readily available computer algebra systems like Maple or *Mathematica*, this was where we all would go to look up integrals that we were having problems with. I'd still recommend at least looking at a copy of this book once or twice. Most of the book actually isn't mathematical data, but assorted data tables on material constants and other such useful information. These days we Google everything, but this used to be a treasured resource.)
- Feller, W. (1966). *An Introduction to Probability Theory and its Applications* (2nd Ed). Wiley. (Considered pretty much the standard for applied Probability theory. A real gem.)

- Hassani, S. (2008). *Mathematical Methods: For students of Physics and Related Fields* Springer. (I've heard this is a good book; haven't used it myself).

- Jefferys, H. and B. Jefferys (1956). *Methods of Mathematical Physics* Cambridge University Press. (Good reference book. A bit stuffy, but good to have around).

- Mathews, J. and R.L. Walker (1970). *Mathematical Methods of Physics* (2nd Ed). W.A. Benjamin. (Pretty famous text, but I don't know a lot about it).

- Morse, P.M. and H. Feshbach (1953). *Methods of Theoretical Physics* (Parts 1 and 2). McGraw Hill. (Classic books. Were the standard for a long time. Out of print for ages now; hard to find.)

- Nearing, J. (2010). *Mathematical Tools for Physics* Dover. (Also available on-line at http://www.physics.miami.edu/~nearing/mathmethods/). (Excellent, and *free*, text. Very readable.)

- Press, W.H., S.A. Teukolsky, W.T. Vetterling, B.P. Flannery (2007). *Numerical Recipes: The Art of Scientific Computing* (3rd Ed.) Cambridge University Press. (Although the use of computers to solve problems will not be a central topic in this class, many consider using computer algebra systems like MAPLE or Mathematica to be related to the course content here. If a computer algebra system doesn't have it built in, this book will have a description of how to accomplish the task in a computer language like C, C++, FORTRAN, etc. It is an excellent text to have on your bookshelf as a reference if you ever use computers to do math for you.)

- Riley, K.F., M.P. Hobson, and S.J. Bence (2002). *Mathematical Methods for Physics and Engineering: A Comprehensive Guide.* (2nd Ed.) Cambridge University Press. (I don't know much about this text, but I've heard of it being used in classes at or near this level. Seems to be gaining some popularity, but I've never paged through it.)

- Schey, H.M. (2005). *Div, Grad, Curl and all that* (4th ed.) W.W. Norton and Company. (Kind of a standard for vector calculus. We used it in my Vector/Tensor class as an undergraduate. If you didn't really grok Calculus III to the degree you hoped to, this might not be a bad text to take a look at.

- Strang, G. (1986). *Introduction to Applied Mathematics* Wellesley-Cambridge Press. (Material discussed doesn't overlap too strongly with our course content; good general book on applied mathematics, but topics chosen don't necessarily mesh perfectly with the undergrad Physics course curriculum).

- Strang, G. (1988). *Linear Algebra and its Applications* (3rd ed.) Harcourt-Brace-Jovanovich. (I'm a big fan of Strang's books; seems to write in a very intelligible way. This helped me through some real conceptual issues with Linear Algebra – which, at one point, was a subject I struggled with a great deal).

- Weinreich, G. (1998). *Geometrical Vectors* University of Chicago Press. (An interesting little book that gives a different physical interpretation to a lot of vector ideas than other texts. If you want a text that doesn't feel like a textbook, but rather seems like a story that teaches you something – you might want to pick this up. Good leisure read, but not something you would run to if you needed to be reminded on how to calculate something.)

I know I am missing some major obvious choices, but this should certainly give you at least a few other places to look things up. Also, don't forget to occasionally check your other course texts! Most undergrad E&M books do a pretty good job with separation of variables/Poisson's equation/vector calculus. Most QM books give a decent description of the general eigenvalue problem, etc. If there's a particular topic that we spend a week or two on that you'd like to investigate on your own in more detail, stop by my office and I can tell you about a few books that focus on that topic exclusively.