

Geography 210A – Analytical Methods in Geography (Fall 2012)

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<http://www.geog.ucsb.edu/~bodo/classes.php?pg=classes#am210a>

Geog210A, Analytical Methods, M, W 9:30-10:45, EH2620 or EH2610 ('Star Lab')

Lab (Problem Session): M 11:00-11:50, EH 2620

Office hours: Monday 1-3 pm, EH 4816

Purpose:

- Learn the language of mathematics, become more comfortable with it and apply problem-solving methodologies.
- Reduce the fear of mathematics.
- Develop your analytical intuition.
- Integration of computer solutions using the software package Matlab.
- Figure out where to look up what you need to know to solve your problem.
- It will carry over to every aspect of your work.

Approach: No real mathematic proofs. [If you want it proved, take a math class.] Most of the lectures are problem based as you only learn by doing. Most important thing to remember: *Problem documentation* is critical. Neatness and organization counts and will be graded. Visualize the links from words to pictures to equations and back again. If you don't know it, look it up.

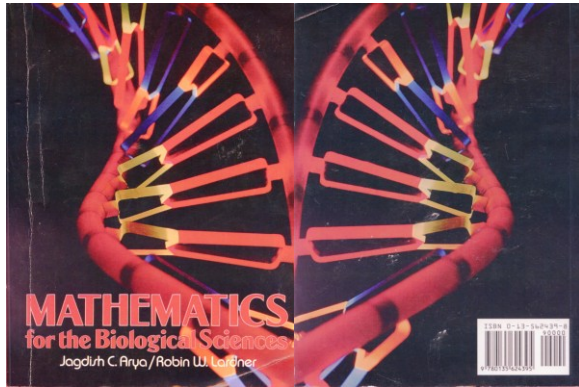
Grading: 70% homework, 20% final & 10% section participation

Rules: No audits. If you do not want to take the class, then don't take it. You won't learn anything by listening to me – you can only learn the methodologies and approaches by doing it.

Successful completion of all homework is required as is attendance and participation in the problem sessions. Homework will be self graded during the problem sessions and turned in after the session for an overall grade for clarity (i.e., -1, 0 or +1). No late homework will be accepted.

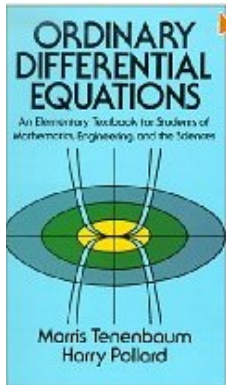
The final Homework will be comprehensive, open book, take home and based upon problems that you have done in class. It will due the Thursday of finals week (Dec. 13) by 12 noon.

Required Text:

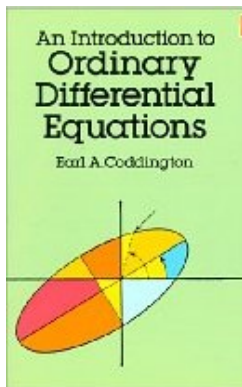


J.C. Arya / R.W. Lardner,
*Mathematics for the
Biological Sciences*, Prentice-
Hall Inc., ISBN 0-13-562439

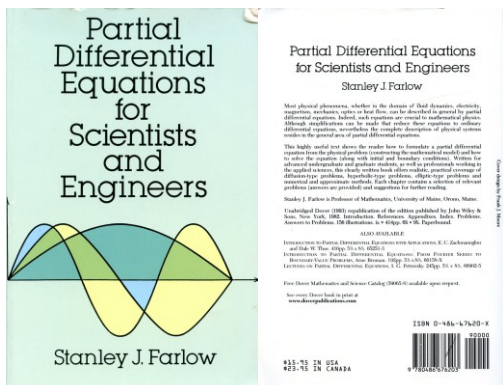
Suggested additional text for Ordinary and Partial Differential Equations:



M. Tenebaum, H. Pollard, *Ordinary Differential Equation*, Dover
Publication, 1985, ISBN 978-0486649405

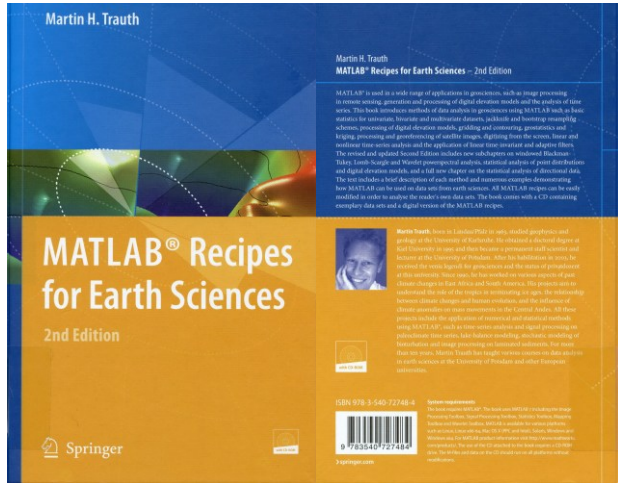


E.A. Coddington, *An Introduction to Ordinary Differential
Equations*, Dover Publications, 1989, ISBN 978-0486659428



S.J. Farlow, *Partial Differential
Equations for Scientists and
Engineers*, Dover Publications,
1982, ISBN 0-486-67620-X

Suggested additional text (if you are interested in Matlab):



Check out the electronic copy at the UCSB Library. Call number: QE33.2.M3 T73 2007ebeb.

Very useful Matlab introduction. Does not provide too much detail, but gives a wide overview of several different methods, including time series analysis, intermediate statistics, and image processing.

M.H. Trauth, *Matlab Recipes for Earth Sciences*, Springer, 2nd edition, 1997, ISBN3540727485.

Syllabus

This may be subject to change during the Quarter!

1. Oct 1 (M) *Introduction, Review of number systems, Example problems*
Homework 1 (due Oct 07): Functions
First steps and Introduction to Matlab, plotting in Matlab, creating functions, solving problems
2. Oct 3 (W) *Functions and Limits, Required Reading: Chapter 1 in Mathematics for the Biological Sciences, Suggested Reading (for problem session): One of the online guides for Matlab listed in the Introduction or Chapter 2 in Matlab – Recipes for Earth Sciences*
3. Oct 8 (M) *Differential Calculus I: Introduction to Derivatives, Required Reading: Chapter 2 in Mathematics for the Biological Sciences*
Homework 2 (due Oct 15): Differential Calculus I
4. Oct 10 (W) *Differential Calculus II: Derivatives of functions and their rules, Required Reading: Chapter 2 in Mathematics for the Biological Sciences*
5. Oct 15 (M) *Differential Calculus III: Exponential and Logarithm Functions, Required Reading: Chapter 3 in Mathematics for the Biological Sciences*
Homework 3 (due Oct 22): Differential Calculus II
6. Oct 17 (W) *Differential Calculus IV: Applications of Derivatives, Required Reading: Chapter 4 in Mathematics for the Biological Sciences.*
7. Oct 22 (M) *Differential Calculus V: Applications of Derivatives, Required Reading: Chapter 4+5 in Mathematics for the Biological Sciences.*
Homework 4 (due Oct 29): Differential Calculus III
8. Oct 24 (W) *Differential Calculus VI: Trigonometric Functions, Required Reading: Chapter 5 in Mathematics for the Biological Sciences.*
9. Oct 29 (M) *Integral Calculus I: Introduction to Integration, Required Reading: Chapter 6 in Mathematics for the Biological Sciences.*
Homework 5 (due Nov 05): Integral Calculus I
10. Oct 31 (W) *Integral Calculus II: Methods of Integration and definite Integrals, Required Reading: Chapter 6+7 in Mathematics for the Biological Sciences.*
11. Nov 5 (M) *Integral Calculus III: Examples and Applications, Required Reading: Chapter 6+7 in Mathematics for the Biological Sciences.*
Homework 6 (due Nov 14): Integral Calculus II
12. Nov 7 (W) *Multidimensional Calculus I: Functions of several variables, Required Reading: Chapter 9 in Mathematics for the Biological Sciences.*
Nov 12 (M) no class, Veterans' Day Holiday

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13. Nov 14 (W) *Differential Equation I: Review of Differential Calculus and Introduction*, Required Reading: Chapter 9 in Mathematics for the Biological Sciences

Homework 7 (due Nov 19): Differential Equation I

14. Nov 19 (M) *Differential Equation II: Examples and Linear First Order Differential Equations*, Required Reading: Chapter 9 in Mathematics for the Biological Sciences

Homework 8 (due Nov 26): Differential Equation II

15. Nov 21 (W) *Differential Equation III: Examples and Linear First Order Differential Equations*, Required Reading: Chapter 9 in Mathematics for the Biological Sciences

16. Nov 26 (M) *Differential Equation IV: Examples and Systems of Differential Equations*, Required Reading: Chapter 9 in Mathematics for the Biological Sciences

Homework 9 (due Dec 5): Differential Equation III

17. Nov 28 (W) *Differential Equation V: Examples and Partial Differential Equations*, Required Reading: Chapter 12 in Mathematics for the Biological Sciences

18. Dec 3 (M) *Differential Equation VI: Examples and Partial Differential Equations II*, Required Reading: Chapter 12 in Mathematics for the Biological Sciences

19. Dec 5 (W) *Review*

Dec 8-14 Finals week

Final exams will be posted online on Monday, Dec. 10. Final examinations are due Dec 13 (Thursday) noon. Absolutely no late exams accepted.