

Mathematics 4043, Fall 2011

Applied Mathematics

Instructor Dr. Bruce Conrad

Meeting times Tuesdays & Thursdays, 0930-1050 in Barton B-401. The first meeting will be Tuesday, August 30, and the last will be Tuesday, December 6. There will be no class on Thursday, November 24, because of the Thanksgiving holiday. The final examination will be on Thursday, Dec. 15, 0800–1000 in Barton B-401.

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Hours: Tuesdays, Thursdays, 1100-1150 and Wednesdays 1630-1720. If these hours conflict with your schedule, you may make an appointment by email.

Text *Wavelet Theory: An Elementary Approach with Applications* by David K. Ruch and Patrick J. Van Fleet. J. Wiley, 2009. ISBN 978-0-470-36840-2

Additional resources *Fourier Series*, by G. P. Tolstov. Prentice-Hall, 1962; Dover Publications, 1976. ISBN 0-486-63317-9. L.C. cat. QA404.T613

Prerequisite Calculus II and Linear Algebra.

Course Goals: Applied mathematics is not an organized subject, and a survey of all of applied mathematics is not possible in a semester course, because one needs to learn about the particular mathematics topic before the applications are introduced. For example, if the topic is modern cryptography, one needs to start with number theory and combinatorics before approaching the application; if the topic is “rocket science” then it is necessary to learn about dynamical systems and celestial mechanics before the rockets take the stage. Our goal is to choose one particular set of applications and the mathematical topics needed to understand them.

Topics covered: The topic I’ve chosen is wavelets. The mathematics behind this includes Fourier series and the Fourier transform, as well as a good bit of linear algebra that we will have to review. We will move on to the classical Haar wavelet transform and the much more modern Daubechies wavelet transform. The applications include image compression (the JPEG algorithm), and the FBI’s digitalization of fingerprints.

Course website: The Blackboard site will contain all homework assignments, and links to websites that you will need to visit during the semester.

Test schedule

Test 1	September 29
Test 2	November 10
Final Exam	December 15, 0800-1000.

Homework. There will be fifteen homework assignments, graded on a scale of 0–10; thus the maximum homework score will be 150. Grades for homework will be according to the following scale (the numerical equivalent will be used in computing your course grade):

Grade	Numerical Equivalent	Point Range
A+	100	120–150
A	95	100–119
B	85	85–99
C	75	70–84
D	65	55–69
F	50	40–54
F–	0	0–39

Collaboration is allowed on homework, provided that it is properly documented. Just hand in one paper with the names of all the participants. Collaborations involving four or more students are forbidden. Each student is allowed up to two late assignments. I do not accept any assignments that are more than one week late.

Optional group project. You may work alone or with one or two other students on a project. To do this, you must tell me approximately what you want to do, and who will be involved, by October 6. An outline, specifying what each participant will contribute, is due by October 13. Participants are graded individually on their papers (0–100; due November 22). I'll schedule oral presentations as well; each member of the group receives the same score on the presentation (again, scale is 0–100). The two project scores will replace your final exam score, so you can skip the final.

If you start a project, and it isn't going well, you can pull the plug on it and take the final instead. Just let me know before November 22.

Grades. Your grade will be based on the final (or project), which comes in 2 parts and counts as two tests, two tests, homework, and class participation. All of these components are equally weighted, but if one of your test scores is abysmal, I will drop it when computing your grade. If you did not submit a project, this applies to part I of the final, which is really test 3, but not to part II, which is comprehensive. If I drop a test score for you, I will lower your grade one notch: for example, if your average without the bad test score is *B+*, I would give you a *B*.

Withdrawals and incompletes. Requests to withdraw from or to drop this course should be taken to the advising office for your college; you do not need my approval. You may not drop the course after September 12, and no withdrawals are permitted after October 31.

The grade *I* is reserved for extreme circumstances. It is necessary to have completed almost all of the course with a passing, or near passing average, and to file an *Incomplete Contract* specifying what is left for you to do. I am required to submit a default grade with an *I*. This will be your grade if the contract is not fulfilled after 12 months. The change will be made automatically by the Registrar's computer.

If you miss the final, you should contact me immediately and discuss your intentions. *Any student who did not submit a project, misses the final and does not get in touch with me before I turn in the grades will be graded F.*

Posting of Grades To obtain your grade on any test, etc., as soon as I figure it out, log into Blackboard.

Information for students who have disabilities Any student who has a need for accommodation based on the impact of a disability should contact me privately to discuss the specific situation as soon as possible. Contact Disability Resources and Services at 215-204-1280 in 100 Ritter Annex to coordinate reasonable accommodations for students with documented disabilities.