

# Computational Methods and Uncertainty Quantification for Inverse Problems

SYLLABUS: MATH 514, Topics in Applied Math

**Professor:** John Bardsley

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**Time and Place:** MWF 11:10-noon, Math 108.

**Course Web Page:** <http://web.math.umt.edu/bardsley/courses/514/514.html>

**Office Hours:** noon-1pm Monday, Wednesday, Friday.

**LEARNING GOALS:** By the end of the course you should:

1. understand what characterizes a typical inverse problem;
2. be able to implement methods of regularization and regularization parameter selection for solving inverse problems;
3. be able to solve inverse problems in both one- and two-dimensions, using both direct and iterative methods;
4. understand the relationship between Markov random field priors, Bayes' Law, and classical regularization methods in inverse problems;
5. be able to implement MCMC methods for sampling from the posterior density function in inverse problems;
6. be proficient at using MATLAB to do all of the above.

**ASSESSMENT:** Your course grade will be determined by your performance on the homework, and potentially, by your performance on a final project.

*★ Students may work together on the homework, however each student must write-up his or her own solutions to hand in.*

**STUDENT CONDUCT:** Just be honest, and see the above '★' comment. Details of the Student Conduct Code can be found in the "A to Z Index" on the UM home page.

**FOR ANY STUDENT WITH A DISABILITY:** If you have a disability that has, or might have, an effect on your performance in this class, please let me know. I will do my best to accommodate you.

**Important Dates:**

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| February 12            | Last day to drop with a refund.                    |
| February 13 – March 28 | Drop requires instructor and advisor's signature.  |
| March 29 – May 6       | In addition, a drop requires the Dean's signature. |
| May 13, 8-10am         | <b>Final exam time.</b> Subject to change.         |