

# Computational Methods and Uncertainty Quantification for Inverse Problems

SYLLABUS: MATH 514, Topics in Applied Math

**Professor:** John Bardsley

**Office:** Math 210

**Phone:** 243-5328

**Email:** bardsleyj@mso.umt.edu

**Time and Place:** MWF 9-9:50, Math 305.

**Office Hours:** Tuesday 2pm; Wednesday & Friday 3pm.

**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.

**Final Exam:** 8-10am, Thursday, December 14.