

**CDS 301**  
**Scientific Information and Data Visualization**  
Syllabus

**Fall 2008**

**Prerequisites:** Introduction to Computational Science (CDS 101), Computer Science II (CS 211), Analytic Geometry and Calculus (Math 113), Discrete Mathematics (Math 125)

**Credits:** 3

**Date:** Tuesday and Thursday

**Time:** 10:30 AM to 11:45 AM

**Place:** Research Bldg 1, room 202

**Instructors:** Jie Zhang

**Contact Info:** (703)993-1998 (phone), [jzhang7@gmu.edu](mailto:jzhang7@gmu.edu) (e-mail)

**Office Hour:** 3:00 PM to 4:00 PM, Thursday, or by appointment

**Office:** Room 351, Research Bldg 1

**Description:** The course focuses on visualization of scientific data. Both visualization principles and practical design issues are addressed. The course introduces the visualization pipeline. It covers the visualization of scalar data, vector data, and tensor data. It also covers image visualization, volume visualization and finally information visualization. It discusses the effective use of visualization in various areas of the natural sciences, and examples of application will be drawn from these areas. It emphasizes the importance of visualization in understanding observations, examining theories, and fostering new scientific hypothesis.

**Content:**

- From Graphics to Visualization
- Human Perception
- Data Presentation
- Visualization Pipeline
- Scalar Visualization
- Vector Visualization
- Tensor Visualization
- Domain-Modeling Techniques
- Image Visualization
- Volume Visualization
- Information Visualization

**Software Tools:** C/C++, OpenGL, Matlab, IDL

**Homework:** There will be 6 – 8 small assignments, including data analysis, programming for graphic applications, use of high-level graphics software, and design of graphical displays.

**Project:** The project will be a research paper to analyze data from the student's area of interest. The research must involve the use of visualization in a significant way, either in the analysis or in the presentation or both.

**Exams:** There will be one midterm and one final exam.

**Grades:** Homework (25%), Project (25%), Midterm (20%), Final Exam (30%)

**Class URL:** [http://solar.gmu.edu/teaching/2008\\_CDS301/](http://solar.gmu.edu/teaching/2008_CDS301/)

**Text Book (required):** "Data Visualization: Principles and Practice", by Alexandru C. Telea, A K Peters Ltd, ISBN-13: 978-1-56881-306-6, 2008

**Supplement Reference Books:**

1. "Information Visualization: Perception for Design", second edition, by Colin Ware, Morgan Kaufmann Publishers, ISBN-13 978-1-55860-819-2, 2004
2. "Information Visualization: Beyond the Horizon", second edition, by Chaomei Chen, Springer, ISBN 1-85233-789-3, 2004
3. "Introduction to Scientific Visualization", by Helen Wright, Springer, ISBN-13: 978-1-84628-494-6, 2007