**GGS 590: Special Topics**

**Spatial Data Programming**

**GGS 590-002/GGS 470**

**Instructors: Ruixin Yang**

**Contact Instructor:** [**Ruixin Yang**](http://mason.gmu.edu/~ryang/)

# Exploratory Hall [2409](mailto:2409), Tel: 993-3615, E-mail: [ryang@gmu.edu](mailto:ryang@gmu.edu)

**Time & Place**: Wednesdays, 4:30pm-7:10pm, Exploratory Hall 2310   
**Office Hours**: Tuesdays, 2:30 pm-4:30 pm or by appointment.

**Text Books:**

**Required (Primary)**:

* Stormy Attaway, 2013, [Matlab, A Practical Introduction to Programming and Problem Solving](http://www.amazon.com/Matlab-Third-Edition-Introduction-Programming/dp/0124058760/ref=dp_ob_image_bk), 3rd Edition, Butterworth-Heinemann, Boston. (Call Number: QA297 .A87 [1st edition]; ISBN: 978-0124058767)

**Recommended (Secondary)**:

* [Amos Gilat](http://www.bestwebbuys.com/Amos-Gilat-author.html?isrc=b-compare-author), [Vish Subramaniam](http://www.bestwebbuys.com/Vish-Subramaniam-author.html?isrc=b-compare-author), 2010, [Numerical Methods for Engineers and Scientists: An Introduction With Applications Using Matlab](http://www.bestwebbuys.com/Numerical-Methods-for-Engineers-and-Scientists-An-Introduction-ISBN-9780470565155?isrc=b-search)**,** John Wiley & Sons Inc. ([QA297 .G49 2008](http://magik.gmu.edu/cgi-bin/Pwebrecon.cgi?SC=CallNumber&SEQ=20120515120055&PID=D-FO0qsfQChN2R56DEvixYnaRbkFD-4&SA=QA297+.G49+2008); ISBN-10: 0470565152; ISBN-13: 9780470565155)
* [Nicholas J. Higham](http://www.bestwebbuys.com/Nicholas-J-Higham-author.html?isrc=b-compare-author), [D. J. Higham](http://www.bestwebbuys.com/D-J-Higham-author.html?isrc=b-compare-author), [Desmond J. Higham](http://www.bestwebbuys.com/Desmond-J-Higham-author.html?isrc=b-compare-author), 2005, [Matlab Guide](http://www.bestwebbuys.com/Matlab-Guide-ISBN-9780898715781?isrc=b-search) (2nd edition), Society for Industrial & Applied. (QA297 .H5217; ISBN-10: 0898715784; ISBN-13: 9780898715781)
* Martinez and Angel R. Martinez, 2008. “Computational statistics handbook with MATLAB,” Chapman & Hall/CRC, Boca Raton, Florida (QA276.4 .M269 2008)

**Supplementary Materials (on math and statistics)**

**GMU Catalog Entry (unofficial):**

**This course will cover statistics, math, and scientific programming. Scientific programming in Matlab will be the major component of the courses. Import math and statistics concepts, methods, and algorithms, which are fundamental and needed for other GGS courses, will be covered, and their implementation will be integrated with the Matlab programming. Tentative topics include** probability concept and theory. specific distributions, random number generators, and basic descriptive statistics basic principles of inferential statistics. Application materials will be added later based on the interest of the class.

**Prerequisites:** none   
**Prerequisite Skills:** A good comprehension of algebra and basic trigonometry. Basic calculus is helpful but not required.

**Goals and Objectives:**

To introduce essential principles in **Statistics, Mathematics and Scientific Programming** to those students majoring in GGS graduate programs. Both understanding and the implementation of the corresponding analysis methods and programming techniques will be covered.

**Learning Outcomes:**

After successful completion of this course,

1. Students will understand essential principles of statistics;
2. Students will be able to analyze given general data sets and to compute descriptive measures;
3. Students will be able to solve data analysis problems with scientific programming.
4. Students will be able to use numerical simulation for inferential statistics

**Course Web Site**: Mason Blackboard System at [mymason.gmu.edu](http://mymason.gmu.edu)

**Grading Policy:**

Homework Assignments: 70%

Final Assignments(470)/Project(590) 30%

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Total 100% (**Letter grades based on relative numbers)**

**General Course Policies**

* Attendance will not be considered in the final grade.
* Late assignments will be accepted in the following 1&1/2 days (by Friday noon) with no penalty. Late assignments beyond 2 days will be accepted and considered for the final grade. However, the late submissions will not be graded as regular submissions.
* Extra credit points may be granted to extra efforts, especially those including creative thinking.

**The followings are university wide required information from Office of the Provost:**

**ACADEMIC INTEGRITY**

GMU is an Honor Code university; please see the University Catalog for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you  
will perform that task. When you rely on someone else’s work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

**GMU EMAIL ACCOUNTS**

Students must use their Mason email accounts—either the existing “MEMO” system or a new “MASONLIVE” account to receive important University information, including messages related to this class. See <http://masonlive.gmu.edu> for more information.

**OFFICE OF DISABILITY SERVICES**

If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Services (ODS) at 993-2474. All academic accommodations must be arranged through the ODS. <http://ods.gmu.edu>

**OTHER USEFUL CAMPUS RESOURCES:**

* WRITING CENTER: A114 Robinson Hall; (703) 993-1200; <http://writingcenter.gmu.edu>
* UNIVERSITY LIBRARIES “Ask a Librarian”  
  <http://library.gmu.edu/ask>
* COUNSELING AND PSYCHOLOGICAL SERVICES (CAPS): (703) 993-2380;  
  <http://caps.gmu.edu>

**UNIVERSITY POLICIES**

The University Catalog, <http://catalog.gmu.edu>, is the central resource for university policies affecting student, faculty, and staff conduct in university academic affairs. Other policies are available at <http://universitypolicy.gmu.edu/>. All members of the university community are responsible for knowing and following established policies.

**Tentative Course Contents** (details will be added during the semester. Last modified on August 28, 2015):

Part I: Basic Programming in Matlab (Part 1 of the Textbook)

Part II: Special Topics with Matlab Programming (Selected topics in Part 2 of the Textbook)

* Plot
* Image processing

Part III: Programming with Spatial Statistics

* Basic statistics
  + Random numbers
  + Probability
  + Central limit theorem
* Spatial statistics
  + Spatial randomness, Poisson distribution
  + Numerical simulation for inferential statistics (Moran’s I)
  + Simple Kriging (if time allows)

**Assignments: About 7, or one for every other week**

**Final Exam (Dec. 16th)**

* + Assignment/Project report due