Department of Geography and Geoinformation Science

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GGS 563
Advanced Geographic Information Systems
(Spring 2017)

1. General Information

Instructor:	Dr. Dieter Pfoser
Where:	Fairfax Campus, Exploratory Hall 2103 (Computer Lab)
When:	Thursday 4:30pm to 7:10pm.
Course website:	Blackboard
Credits:	3.0
Prerequisites:	Graduate Students: GGS 553 or permission of instructor.

Instructor's Office Hours: Wednesday, 3:00pm-4:00pm

2. Course Objectives

The goal of this course is to enable students to develop a good understanding of emerging new geospatial data sources and also including relevant data models and data management techniques. The studied subjects include Big Data including the Semantic Web and Linked Data, Web APIs and novel data management systems such as NoSQL databases.

Students will learn how to utilize these new data sources and learn techniques for managing such complex spatial datasets. The specific topics addressed are VGI (crowdsourcing geospatial data sets and user contributed content), *linked data* (RDF, SPARQL), *non-traditional Web data sources* (data streams, Web APIs, e.g., Twitter), and *novel data management tools* (MongoDB). In addition, we will briefly cover relational databases as a contrast to more recent trends.

3. Course schedule

The course will be taught as a combination of lectures, topic/problem oriented discussion, and tutorials based on independent reading and class discussion.

4. Textbooks

In addition to the following and recommended textbooks, the students will be provided additional material in the form of handouts and Web links.

- NoSQL databases
  - **RECOMMENDED - MongoDB: The Definitive Guide,** Kristina Chodorow, O'Reilly Media; 2 edition (May 26, 2013)
    - Available online - library link: http://gml-primo.hosted.exlibrisgroup.com/GMU:Everything:GMU_VOYAGER3620425
  - **Handouts + Web links**

- Semantic Web, Linked Data
  - **RECOMMENDED - Linked data: structured data on the web.** David Wood et al., Manning Publications, 2014.

- ▪ Available online - library link: http://magik.gmu.edu/cgi-bin/Pwebrecon.cgi?BBID=3668336
  - o *Linked data : a geographic perspective*. Glen Hart and Catherine Dolbear, CRC Press, 2013
    - ▪ Available online - library link: http://magik.gmu.edu/cgi-bin/Pwebrecon.cgi?BBID=3622243
  - o *Linked Data: Evolving the Web into a Global Data Space*
    - ▪ book Web site - http://linkeddatabook.com
    - ▪ html version - http://linkeddatabook.com/book
    - ▪ pdf (through GMU library) http://www.morganclaypool.com/doi/abs/10.2200/S00334ED1V01Y201102WBE001
  - o **Handouts + Web links**

Support topics – read up on!

- • Spatial databases/GIS
  - o *Spatial Databases, a tour.* Shashi Shekhar, Sanjay Chawla. Prentice Hall, 2003 (GMU Library link http://magik.gmu.edu/cgi-bin/Pwebrecon.cgi?BBID=1030458)

5. **Course outline (tentative)**

In this course, we will cover the following topics (please note that the topics and their order are subject to change at the discretion of the instructor, any changes will be announced in class):

Week of	Lec. #	Topic	Assignment
01/26	1	Introduction and course overview – emerging trends and challenges	Lab 1 (Overview of trends)
02/02	2	Overview data models	
02/09	3	Relational databases	Lab 2 (Relational Queries)
02/16	4	Relational databases and noSQL database comparison	
02/23	5	Data management – noSQL databases, MongoDB	
03/02	6	MongoDB Queries	Lab 3 (MongoQueries)
03/09	7	MongoDB Spatial Queries	
03/16		SPRING BREAK	
03/23	8	Midterm	
03/30	9	Semantic Web	Lab 4 (Semantic Web)
04/06	10	Linked Data concepts	
04/13	11	Instructor out of town	
04/20	12	Linked Data	Lab 5 (Linked Data)
04/27	13	Sourcing Web data, Web APIs	
05/04	14	VGI and new trends	Lab 6 (Reflection paper)

6. **Attendance**
You are required to attend all class meetings. Your active participation in the class is essential to the success of this course.

7. **Grades**
Each assignment and written exam will be given a numerical grade on a 0-100 scale. Some assignments may include bonus tasks. At the end of the term all the marks will be totaled as a <u>weighted average</u> according to the following weights:

Lab assignments	**40%**
Midterm	**30%**
Final	**30%**

Please note that in general all assignments will not have the same weight. The weight of each individual assignment will be indicated on the assignment form. Final grades at the end of the course will be assigned using **a combination of absolute achievements and relative standing in the class**.

8. **Exams**
   The course includes two mandatory written exams. The material covered in the exams will be announced in class. A student who cannot write a course examination or complete a course assignment because of an incapacitating illness, severe domestic affliction or other compelling reasons can apply for extension of time to complete an assignment.

9. **Assignments:**
   The course will include several written assignments on selected topics from the material covered in class and in the assigned reading. Assignments may include tasks such as database queries, analysis of data processing results, and discussion/analysis of theoretical concepts and test cases. All assignments are mandatory. Typically, two weeks will be allocated for every assignment (please see Section 10 for details on late submission policies).

   Assignments should be done **through the Blackboard course website**.

   Please note: Assignments should be submitted only through the Assignment submission section of the Blackboard system - DO NOT email assignments directly to the instructor.

10. **Late lab submission:**
    Labs submitted **after the due date will not be accepted**. Exceptions to this policy may be made given serious circumstances at the discretion of the Instructor.

    Please note: Deferred of term work is a privilege and not a right; there is no guarantee that a deferral will be granted. Please make sure you notify the instructor as soon as you know a deferral is required.

11. **Course website:**
    The course has a Blackboard website. This website will provide you a single portal through which you may obtain lecture notes, retrieve assignment data and, review links to additional materials, and receive special announcements. You are required to visit the course website **regularly**. Please notify ITU (and, if necessary, the instructor) if you encounter any problems accessing this website.

12. **Electronic communication:**
    All course related email correspondence, including submission of assignments, should be made through the course Blackboard website. Please DO NOT send emails to the instructors' @gmu.edu address.

13. **Students with special needs:**
    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. Please do not hesitate to contact me regarding your special needs if you encounter any problems.

14. **Academic integrity:**
    George Mason University is committed to the **highest standards** of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the GMU honor code (online at http://academicintegrity.gmu.edu).

15. **General guidelines for ASSIGNMENT preparation and submission**
    a. Grades of assignments will be based on:
       – **Academic merit** of your answers.

- **Conciseness** and **completeness** of your answers. Please write to the point and explicitly address the question or task. Avoid using unnecessary graphics (figures, tables, graphs etc.) unless they serve a specific purpose. Make sure to use captions and to refer to the graphics you include in your written answer. Graphics without any reference or accompanying explanation will be disregarded.
    - **Organization** and **presentation**. Remember that your assignment report is a reflection of your thinking and learning process. Please organize your report in a logical fashion so that your answers could be easily identified. A general format for your presentation should, as a minimum, include the following components: (1) Question number, (2) Your written answer and/or description and discussion of your results, and (3) Visualization of your results, e.g. images, graphs, tables, as necessary.
  b. Please remember that your assignment is a **professional document**, and should therefore be formatted and constructed accordingly. All assignments are to be typed. Hand-written assignments will not be accepted.
  c. Submission of a hardcopy will be made in class; submission of a softcopy will be made through Blackboard.
  d. The electronic submission of your assignment report has to be in **PDF format**.
  e. If more than one file is submitted, you may submit a single **ZIP** file containing all the assignment files.
  f. Each assignment submission should include a cover page with the following information: assignment title, assignment number, student name, and submission date.
  g. Please make sure you have a backup of all the materials you submit.

16. **Other useful campus resources:**
  a. The writing center: A114 Robinson Hall; (703) 993-1200; http://writingcenter.gmu.edu
  b. The University libraries "ask a librarian"; http://library.gmu.edu/mudge/IM/IMRef.html
  c. Counseling and Psychological Services (CAPS): (703) 993-2380; http://caps.gmu.edu

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Disclaimer: Any typographical errors in this Course Outline are subject to change and will be announced in class. The date of the final examination is set by the Registrar and takes precedence over the final examination date reported by the instructor.

Note: Recording is permitted only with the prior written consent of the professor or if recording is part of an approved accommodation plan.