GGS 656 - **The Hydrosphere;** Credits: 3
7:20 - 10 pm Mondays; Exploratory Hall 2310
Jan 21, 2019 - May 13, 2020

Syllabus

Overview: Components and transfer processes within the hydrosphere, which consists of aqueous envelope of Earth, including oceans, lakes, rivers, snow, ice, glaciers, soil moisture, groundwater, and atmospheric water vapor. Offers understanding of various components of the hydrosphere, spatial and temporal distributions, physics of transfer processes for redistribution, and appreciation of water's role in sustaining life and influencing global and regional energy and mass balance.

Prerequisites: Two semesters of calculus, preferably partial differential equations; or permission of instructor.

Instructors: Dr. Paul R. Houser Telephone: 301-613-3782
Office: Exploratory Hall–Room 2209 E-mail: phouser at gmu.edu
Office Hours: Mondays 4-6pm (appointments preferred)

Required text: Dingman, S. L., Physical Hydrology, 3rd Edition,Waveland Press, Inc.., 2015
Widely available as eText or hardcopy. 2nd edition is also OK.

Procedure: Material will be covered by lectures, not necessarily restricted to the text/supplemental and handouts. Students are expected to read the text and other assignments thoroughly prior to the lecture.

Performance: Material covered on the final exam will include handouts, lecture notes and outside readings.

Evaluation: All work must be your own. A grade of "0" will be assigned for any work which is clearly not your own or cheating of any type.

Homework	28 points (4 per assignment)
Paper Presentation	10 points
Final Exam	20 points
Pop Quizzes	12 (2 Points per quiz)
Team Project	30 points
TOTAL	100 points

Homework assignments: All assignments should be done neatly and professionally. All homework should be submitted on blackboard by the due date. The problem should be defined, diagrammed (if appropriate), and the solution should be developed in a step-by-step procedure. Spreadsheet answers can be included. The final solution should be reported to the appropriate significant figures and underlined. You are encouraged to work together in study groups; however, identical (copied) homework will be awarded a grade of zero (0). Incorrect homework may be neatly reworked and resubmitted for re-evaluation and partial credit.

Team Project: The project will consist of a modeling or data analysis exercise to investigate a well-posed hydrological question. Models may be written by the student team, or an existing model may be selected

for the investigation. Project deliverables will consist of: 1. A brief project proposal presentation; 2. a 20-minute oral presentation. Here are a few ideas:

- The transmission of dam-induced stage changes in the Lower Colorado River: Data Interpretation: Stage data from different parts of LCR over tens to more than 100 km will be collected and analyzed to determine how a dam-induced flood travels through the LCR.
- The transmission of dam-induced stage changes in the Lower Colorado River: Modeling. Dam-induced stage variations will be modeled using kinematic wave or diffusive wave approximations. The model will be driven by upstream data.
- Measurement of discharge and stage changes in a local River. Students will deploy pressure transducers along different parts of the river to monitor dam-induced stage fluctuations.
- Measurement of moisture changes in the riparian zone of the Lower Colorado River due to dam-induced stage changes. This project will consist of a historical assessment of the LCR and how floods (natural and managed) have altered its course, if any.
- A 'backward' systems dynamics hydrologic model for a local creek/river.
- Discharge data from a local creek/river will be analyzed following Kirchner (Water Resources Research, 2009)
- A 'backward' systems dynamics hydrologic model for local springs/creek.
- Is Virginia getting warmer? Focus on extreme temperatures
- Students will collect ground and air temperature archives from weather stations across the state and delineate trends for number of days above 90 F or some other threshold, if any.
- Long-term (decadal) discharge variations in undammed Virginia rivers. Historical discharge data from undammed rivers or those little affected by dams will be analyzed.

Other project ideas:

http://www.ce.utexas.edu/prof/maidment/gradhydro99/termproj.html

http://www.ce.utexas.edu/prof/maidment/giswr2010/docs/termpaperlibrary.htm

Paper Presentation: Each student will be required to present a relevant research paper or topic at the start of one of the class sessions. The 15 minute presentation should be generally relevant (but not redundant) to the topic covered during that class session. Grading will be based on (1) relevancy and creativity of chosen paper/topic, (2) quality of presentation and visuals, (3) responses to questions and discussion. ***Any review materials should be sent out to the class by the Friday before the presentation. Please select a date for your paper presentation – preference will be given on a first come first served basis.***

Late Work: All work is expected to be completed on time.

Disabilities: Students with disabilities that require accommodation should contact the instructor so that the necessary arrangements can be made.

Course Outline

Date	Topic
Jan 27	Introduction: Course Requirements, Basic Hydrologic Concepts (Ch 1-2) Homework #1: (see Blackboard)
Feb 3	Precipitation (Dingman Ch 4) 15min Student Presentation: Homework #1: (see Blackboard)
Feb 10	Snow and Snowmelt (Ch 5) – On-Line Video Lecture (no in-class meeting) Homework #2: (see Blackboard)
Feb 17	Climate, soils and vegetation (Ch 3) 15min Student Presentation: Homework #3: (see Blackboard)
Feb 24	Hydrometeorology 15min Student Presentation Homework #4
March 2	Team Project Proposal Presentations
March 9	**Spring Break (no class)**
March 16	Water in Soils (Ch 6) 15min Student Presentation: Homework #5: (see Blackboard)
March 23	Evapotranspiration (Ch 7) 15min Student Presentation:
March 30	Groundwater (Ch 8) 15min Student Presentation: Homework #6: (see blackboard)
April 6	Streamflow (Ch. 9) 15min student Presentation: Homework #7: (see Blackboard)
April 13	Water in Oceans – Guest Lecturer?, Dr. Barry Klinger, AOES 15min Student Presentation:
April 20	Water in Ice 15min Student Presentation:

April 27 Water Resource Management (Ch 10)
15min Student Presentation:

May 4 Team Project Presentations & Review for Final
Final Exam Guidance

May 11: 7:30-10:15pm Final Exam (24-hour Take Home Exam)

NOTE: This is a course outline and is subject to revision at the discretion of the instructor. You will be informed in class if changes are made.

WEB RESOURCES:

On-Line Precipitation Data:

http://www.eol.ucar.edu/projects/hydrometnet/virginia/
http://www.afws.net/search.htm
http://va.water.usgs.gov/
http://waterdata.usgs.gov/va/nwis/current/?type=precip&group_key=county_cd
http://afws.erh.noaa.gov/afws/county.php?type=precip&state=51
http://www.erh.noaa.gov/marfc/Archive/Precip/
http://www.cocorahs.org/ViewData/
http://climate.geog.udel.edu/~climate/html_pages/download.html
http://www.mlbs.virginia.edu/data.html

Hydrologic tools and data:

http://his.cuahsi.org/

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 activate their GMU email accounts to receive important University information, including messages related to this class.

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/mudge/IM/IMRef.html
COUNSELING AND PSYCH 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 affairs.