

FOR 520 (Graduate) – Watershed Hydrology – Fall 2018

I. Information

Location: 1220 Jordan Addition (Lecture), 3214 Jordan Addition (Laboratory)

Time: WF 10:15 – 11:30 AM (Lecture), F 1:30 - 4:20 PM (Laboratory)

Instructor: Dr. Ryan Emanuel, 2217 Jordan (ryan_emanuel@ncsu.edu), 919-513-2511

Office Hours: Mondays & Tuesdays 10:00 AM -12:00 PM or by appointment

TA: Ms. Justine Neville, 2213 Jordan (janevill@ncsu.edu), Office Hours: Thursdays 3:00 - 4:00 PM
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II. Course Description

Principles of hydrologic science; classification and delineation of watersheds and stream networks; hydrologic and water quality processes in natural and managed streams; subsurface hydrology; principles of evapotranspiration; hydrologic measurements and data analysis; applications of hydrology and water quality management for forest, agriculture, and urban ecosystems. Emphasis on field-based study of watersheds and hydrologic measurements. One weekend field trip is required. Credit will not be given for both FOR 420 and FOR 520.

A. Course Objectives. Students will:

1. Understand basic principles of the hydrologic cycle and water balance including pools and fluxes important for watershed hydrology.
2. Become familiar with the hydrological aspects of geoscience, atmospheric science, ecology and soil science necessary to understand how watersheds function with respect to biotic and abiotic aspects of the environment.
3. Understand how and why water resources affect human infrastructure and other interests.
4. Practice using tools and techniques used by professional hydrologists for research, resource management and consulting.
5. Practice applying principles of hydrology to their own research or professional work.

B. Learning Outcomes. Students will be able to:

1. Collect hydrological data of their own or assemble data from existing databases necessary to assess watershed-scale pools and fluxes.
2. Identify and apply key relationships governing the movement of water through the environment.
3. Delineate the boundaries of a watershed.
4. Identify major water resource issues and ways of investigating or addressing those issues in NC and elsewhere.
5. Present or explain the results of a project involving the analysis of hydrological data.

III. Course Materials

Textbook: *Elements of Physical Hydrology* by Hornberger, Wiberg, Raffensperger and D’Odorico, 2014, 2nd Edition (ISBN 9781421413730). The text is available online (including an electronic edition). Readings: Additional readings may be distributed digitally via Moodle. Other Materials: Lecture slides, posted online to supplement your own class notes; Calculator

IV. Exams

Two mid-term examinations and one final examination will be given. The exam schedule is:

Mid-term 1: 9/28; **Covers Weeks 1-6**

Mid-term 2: 11/9; **Covers Weeks 7-12**

Final exam: 12/10 (8-11 AM); **Cumulative**

Each exam will cover material presented in class as well as readings assigned during the periods in bold above. As a general rule, makeup exams will not be given. If a University-excused absence

prevents you from attending an exam, please let me know well in advance if the activity is planned, or contact me as soon as possible if the absence is unplanned (medical, etc.). I will arrange for you to take the exam under alternate conditions. Problem sets will be handed out approximately one week prior to each exam. These are not graded, but answers are posted on the web and used during review and exam preparation. These exercises are similar to problems included on the exams.

V. Research Paper/Presentation

Each graduate student will complete a research paper and presentation on a topic of individual interest during the course of the semester. The paper should include data analysis (your own or instructor's) and interpretation in addition to a brief literature review related to the topic. Exact topics are flexible but must include a direct connection to hydrologic sciences. The grade will be based on two separate components: (1) a 12 page or longer (double-spaced) paper, and (2) a 12-minute oral presentation. Topics will be selected by students and approved by Dr. Emanuel no later than Fall Break. Topics may build on but not duplicate previously presented or submitted work. Work is due in November.

VI. Grades

Grades are based on performance on the mid-term and final exams, and laboratory assignments (see section VIII – Laboratories). The final grade comprises the following items and weightings:

Mid-term exams:	40% (20% each)
Assignments and participation:	15% (total)
Research Paper and Presentation:	25%
Final exam:	20%

Numerical grades become final letter grades as follows: 100-97=A+; <97-92=A; <92-90=A-; <90-87=B+; <87-82=B; <82-80=B-; <80-77=C+; <77-72=C; <72-70=C-; <70-67=D+; <67-62=D; <62-60=D-; <60 = F

VII. Policies

Academic Integrity: This course will follow the provisions of the Academic Integrity Code, which can be found on the NCSU Student Affairs website. In summary, do not lie, cheat, steal, or give me reason to suspect that you are doing so. Whether working individually or in a group, give an honest accounting of your work and give credit where credit is due. Any form of cheating results in an automatic “F” for the assignment or exam with which it is connected. Violations of academic integrity may result in an F for the course.

Independent Work: Each student is expected to work independently on all exams. Exams are closed-book and closed-notes. Calculators will be needed for exams, and work should always be shown.

Problem Sets: Problem sets are study tools and will neither be collected nor graded. Students are encouraged to work together on these problems, but should be able to complete them individually. If you have questions, please see me during office hours or contact me to make an appointment.

Attendance: Regular attendance at lectures and laboratories is required. Students will find it difficult to succeed in class if they do not attend regularly, take good notes, and complete problem sets.

Electronics in the Classroom: Texting, checking email or visiting social media sites are never appropriate during class or during labs. These activities are distracting to everyone. If you create such a distraction you will be asked to leave.

Accommodating Disabilities: Students with disabilities in need of accommodation should contact Disability Services Offices (Student Health Services Building, disability@ncsu.edu), and alert the instructor as early as possible during the term.

Course Evaluations: Your evaluations matter and are used to improve this course. Online class evaluations will be available to students on ClassEval during the last 2 weeks of the term. Evaluations are confidential; instructors cannot identify numerical scores and comments of specific students.

Transportation and Safety: The instructor will provide appropriate university transportation to field sites. Use of personal vehicles to field sites is not allowed. Instructors will explain all potential safety hazards and risks to students for coursework and fieldwork. Students will be required to meet safety standards for requisite laboratory inspections and field assessments in order to participate in class activities. Students who do not appropriately follow safety policies and instructions will not be allowed to participate in class activities, which may affect their participation grade. Use of alcohol, tobacco or illegal drugs is prohibited during course activities. Firearms, weapons and fireworks are prohibited in the classroom, in laboratories and on field trips.

Anti-Discrimination: All aspects of this course will constitute a supportive and harassment-free environment for all members of the campus community. All faculty, staff and students are responsible for understanding and complying with harassment policies (<http://oied.ncsu.edu/equity/>). Members of the campus community are encouraged and should feel free to seek assistance, information, and guidance from their department head, supervisor, the Office for Equal Opportunity (919-513-3148), Human Resources (919-515-4300) or the Office for Student Conduct (919-515-2963). All harassment of any person (either in the form of *quid pro quo* or creation of a hostile environment) based on race, color, religion, creed, sex, national origin, age, disability, veteran status or sexual orientation also is a violation of state, federal law and/or NC State University policy and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited.

VIII. Laboratories

FOR 420 Lab is a required component of this course. Several field activities/trips will be conducted in addition to those taking place in the lab. Students are expected to dress appropriately for field labs (i.e. prepare for ‘wet’ experiments and unpredictable weather). Labs will have graded follow-up assignments, which are due in one week. Late assignments will be penalized 10% of the possible grade per day late. Consult the lab syllabus for a detailed schedule. Lab begins on Friday, August 31.

IX. Schedule (Subject to modification)

Week	Date	Topic	Reading
1	8/22	Watershed Water Balance	Hornberger Ch 1 & 2
2	8/29	Watershed Water Balance	Hornberger Ch 1 & 2
3	9/5	Surface Water Hydrology	Hornberger Ch 3 & 4
4	9/12	Surface Water Hydrology	Hornberger Ch 4 & 5
5	9/19	Surface Water Hydrology	Assigned
6	9/26	Review, (MIDTERM 1: 9/28)	
7	10/3	Groundwater Hydraulics (No Class 10/5)	Hornberger Ch 6
8	10/10	Groundwater Hydrology	Hornberger Ch 7
9	10/17	Soil Water Hydrology	Hornberger Ch 8
10	10/24	Water Quality	Assigned
11	10/31	Water Quality	Assigned
12	11/7	Review, (MIDTERM 2: 11/9)	
13	11/14	Hillslope-Stream Continuum	Hornberger Ch 10
14	11/21	No Class	
15	11/28	Ecohydrology	Hornberger Ch 9
16	12/5	Advanced Topics	Assigned
Final	12/10	FINAL EXAM: MONDAY, 12/10 8-11 AM	