# Syllabus – Fall 2012

## REWM 4285 / 5285 – Wildland Hydrology (3 credits)

*Tuesdays/Thursdays 11:00 – 12:15, Engineering 3105 (Lecture)*
*Wednesdays 2:10 – 4:00, Agriculture 4041 (Lab)*

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**Instructor:** Dr. Scott Miller, Department of Renewable Resources
341 Agriculture Building C
snmiller@uwyo.edu; 766-4274

**Office Hours:** Thursdays and Fridays 1-2 or by appointment

**Readings:** Textbook (required): Environmental Hydrology (2nd Edition), by Ward & Trimble, 2004. CRC Press, 475 pp.

Supplemental Readings: Will be available through eCompanion course web site.

**Web Sites:** Course home page available through eCompanion. This site will be the primary portal for communication, including posting updated information or changes to the course. Class notes, supplemental reading, homework assignments, etc. will be available here, so check it often.

**Description:** Water is critical to life and supports social and ecological systems, and understanding hydrologic science allows us to examine important scientific and practical questions. Wildland Hydrology will focus on essential and unique characteristics of the hydrologic cycle occurring on rangelands and forests. Processes controlling all aspects of water and the hydrologic cycle will be covered, from rain and snowfall to infiltration, groundwater, and streamflow. We will also cover some aspects of watershed and land management that affect these processes and how changes in climate and land use alter ecological-hydrology links. You will get the opportunity to use field instrumentation to measure and monitor watershed hydrology in a heavily instrumented watershed located in the Snowy Range used for field-based investigation.

**Objectives:**

1. Identify and quantify the dominant processes of the hydrologic cycle
2. Develop understanding of the principle equations used to quantify these processes
3. Develop understanding of field measurement, error, and data interpretation
4. Build mathematical and modeling skills for hydrologic assessment
5. Gain appreciation for the complex and fascinating nature of watershed hydrology

**Prerequisites:** Quantitative Reasoning I (QA) – MATH 1000, 1450, 1405, or 1450

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| **Grading:** | Homework | 300 points |
| | Attendance and participation | 50 |
| | Midterm exams | 200 |
| | Final Exam | 150 |
| | *Critical Review Paper (grad students only)* | *50* |
| | **Total available points (undergraduate):** | **700** |
| | **Total available points (graduate):** | **750** |

Grading will be on a straight scale. A: 90–100%, B: 80–89%, C: 70–79%, D: 60–69%, F: < 60%.

**Grading Policy:** Late work will be deducted 10% per class period past the due date. Work will not be accepted 2 weeks past due date. In order to finalize grading, work will not be accepted past Thursday, Dec. 6 (week before the final exam).

## Course Organization and Assignments

The course is divided into units designed to build into a comprehensive quantitative understanding of the hydrologic cycle. The primary components that contribute to hydrologic response will be treated individually but will build on each other to foster an appreciation for the complex interactions among watershed processes. Mathematical (algebraic) solutions will be presented and students will be expected to gain mastery of the governing equations. Towards the end of the course we will pull these components together with a section on hydrologic modeling and interpretation.

Graduate students will have an additional assignment, due towards the end of the course, to separate graduate from undergraduate student enrollment. This assignment will be a critical review paper of a current peer-review manuscript.

## Field-Based Study; Snowy Range Instrumentation Sites

An experimental watershed is being established in the Snowy Range, West of Laramie. Paperwork is currently moving through the Forest Service system, and once completed we will be installing a network of runoff and meteorological stations. In this class we will organize a series of field days to visit the site, perform field measurements such as velocity profiling for stage-discharge relationships, water quality monitoring, and soil moisture sampling. You will be expected to participate in at least one of these field days, which will be scheduled on an ad hoc basis once the semester is started.

## Assignment Guidelines

Excellent written communication is essential to being an effective natural resource manager, hydrologist, involved and effective citizen, as well as a successful college student. Writing assignments require the student to research a diversity of source materials and to cite these appropriately. All assignments will be evaluated on content as well as writing mechanics (grammar, punctuation, spelling, etc.) and style (clarity, flow, etc.). All papers should be double-spaced and have: 1" margins on all sides; 12 point, Times font; subheadings to organize content; and page numbers.

All homework should be completed on engineering paper and must clearly indicate your name, assignment name and #, and page #. Show as much of your work as possible, write neatly or type, and circle or highlight your final answer. Pay close attention to units (e.g. ft, cm, m/s etc.). **Please remember that an answer without the proper units is incorrect!**

## Expected Course Schedule

Minimum reading assignments are indicated here. Supplemental readings will be assigned in class and via email. If you miss a class please contact the instructor or a fellow student to see whether additional assignments have been made.

**Unit 1.** Introduction to hydrology and hydrologic process (Text: Chapter 1; On-Line Notes)

- Water resources
- Definition of terms
- Watershed management and natural resource problem solving
- Introduction to statistical methods

**Unit 2.** Precipitation & interception (Text: Chapter 2; On-Line Notes)

- Precipitation processes
- Measurement of precipitation
- Analysis of precipitation
- Interception and net precipitation

**Unit 3.** Snow hydrology (On-Line Notes)

- Measurement of snow and snow water resources
- Snow accumulation, melt, and runoff
- Energy budget
- Forest management of snow water resources
- Snowpack-snowmelt prediction

**Unit 4.** Infiltration & Soil water storage (Text: Chapter 3; On-Line Notes

- Water content profiling
- Soil water potential
- Water flow in saturated and unsaturated soils
- Infiltration and percolation

**Unit 5.** Evapotranspiration (Text: Chapter 4; On-Line Notes)

- Energy budget and fluxes
- Evaporation from free water and soil
- Transpiration
- Potential ET, estimation of actual ET

**Unit 6.** Groundwater (Text: Chapter 11, On-Line Notes)

- Storage and movement of groundwater
- Groundwater water resources
- Managing groundwater resources
- Water budget and surface management for groundwater

**Unit 7.** Runoff & Streamflow (Text: Chapter 5; On-Line Notes)

- Runoff and runoff-generating processes
- Streamflow hydrograph and runoff response
- Streamflow measurement
- Estimating Streamflow

**Unit 8.** Stream Processes (Text: Chapter 6; On-Line Notes)

- Stream channel morphology
- Stream stability & shear stress
- Classification
- Field techniques

**Unit 9.** Open Channel Flow (Text: Chapter 7; On-Line Notes)

- Velocity, discharge & continuity
- Channel modifications
- Structures

**Unit 10.** Soil Erosion & Conservation (Text Chapter 9: Chapter 9; On-Line Notes)

- The erosion process
- Preventing and controlling soil erosion
- Measuring soil erosion
- Predicting soil loss

## Important Dates

Tuesday, August 27: First Day of Class

Wednesday, September 26: Midterm exam #1

Wednesday, October 31: Midterm exam #2

November 21-23: Thanksgiving break

Friday, November 30: Graduate student papers due

Thursday, December 13, 10:15 am-12:15 p: Final Exam

* *Please note that this schedule is subject to change*

## Student Support

If you have a physical, learning, or psychological disability and require accommodations, please let me know as soon as possible. You will need to register with, and provide documentation of your disability to, University Disability Support Services (UDSS) in SEO, room 330 Knight Hall, 766-6189, TTY: 766-3073

## Student Code of Conduct

1. Students should exhibit respectful classroom values and behavior by:
    - engaging in appropriate communication, interaction and preparedness
    - demonstrating trust, respect and civility
    - approaching course content as important and necessary
    - meeting all deadlines for assignments and team member obligations
    - turning off cell phones in class
    - avoiding unnecessary talking
    - not reading outside material or doing other work during class

2. Students should contribute to a positive learning environment by:
    - arriving, attending and departing class in a respectful manner
    - taking responsibility for team and individual assignments
    - developing cooperative relationships with other students and faculty

3. Students should support a professional learning environment by:
    - avoiding inappropriate language
    - refraining from unrealistic expectations in dealing with administration, faculty and staff
    - communicating with the instructor if changes could be made to improve the learning environment

4. Students must uphold the academic integrity standards expected by the University of Wyoming. Academic integrity is conceptualized as doing and taking responsibility for one's own work. This includes individual assignments and the assumption of responsibility for work that is turned in as the "work product" of a team. Each team member is equally responsible for the work presented as the output of that team's effort. Each team member must carefully collaborate and have jointly participated in the final output. The University of Wyoming's definition of Academic Dishonesty referenced in the Student Code of Conduct: "An act attempted or performed which misrepresents one's involvement in an academic task in any way, or permits another student to misrepresent the latter's involvement in an academic task by assisting the misrepresentation." These acts include, but are not limited to: "Representing as one's own work material copied or borrowed from any source, written or otherwise, public or private, without proper citation of the source. *See* University of Wyoming Regulation 802. A good rule of thumb is to never use more than five consecutive words from a source without providing a citation. Student work may be evaluated for plagiarism using anti-plagiarism software if the instructor suspects academic dishonesty.