SWS 5248

WETLANDS and WATER QUALITY

PREREQUISITES: None

COURSE WEBSITE: The course website can be accessed through E-Learning: http://lss.at.ufl.edu

COURSE DESCRIPTION AND STATEMENT OF GENERAL EDUCATION PURPOSE:
Introduction to wetland ecosystems with emphasis on principles and problems associated with their functions and values as related to water quality. Students will become familiar with basic and applied concepts in hydrology, soils and vegetation of both constructed and natural wetlands. The first third of the course will parallel an undergraduate course on wetlands as we learn fundamentals of wetland hydrology, biogeochemistry, soils and vegetation. The middle third of the course will focus on wetlands as a system, understanding the interaction between environmental drivers and succession, nutrient dynamics and community development. The last third of the course will focus on various approaches to evaluate wetland condition as it relates to water quality and other stressors.

COURSE OBJECTIVES:
- To familiarize students with the structure and function of wetlands.
- To make students aware of the role wetlands play at the watershed scale and in regulating global cycles.
- To acquaint the student with various biological, physical and chemical approaches being developed to evaluate ecological integrity of wetlands mainly as it relates to water quality.
- To acquaint the student with policy and regulatory issues related to wetlands and water quality.
- To acquaint the student with concepts of wetlands mitigation, restoration, and integration of constructed wetlands to address water quality and quantity issues in urban and agricultural landscapes

STUDENT LEARNING OBJECTIVES:
- Understand the structure of wetlands including hydrology, biogeochemistry, soils and vegetation adaptations.
• Understand the function of wetlands and how they influence systems at the watershed and global scale.
• Comprehend and analyze the science and techniques being developed to act as indicators of water quality related impacts to wetlands.
• Understand the opportunities and techniques used to integrate constructed and treatment wetlands into human landscapes as a means to mitigate water quality impacts while synthesizing and applying all aspects of wetland structure and ecological processes learned during the course.

COURSE FORMAT: The course material is mainly conveyed via three 40-50 minute lectures per week during the first two thirds of the course. Lectures are prerecorded and made available asynchronously on the Sakai website. The later third of the course will be student presented lectures based on USEPA's Wetland Modules that were developed to assess wetland condition based on biological, biogeochemical and physical characteristics. There will also be weekly chat sessions Thursday evenings from 8-9:30 hosted on Sakai. Chat sessions are not required (although recommended) except for the last later part of the semester when the student responds to class questions about their USEPA Wetland Module.

TEXTBOOK: (suggested, not required)


USEPA Wetland Modules [http://www2.epa.gov/nutrient-policy-data/wetlands-modules](http://www2.epa.gov/nutrient-policy-data/wetlands-modules)

GRADING: Overall grade will be determined based on a student's performance in all of the following categories:

- **Quizzes** 10 %
- **Homework** 10 %
- **Participation** 5 %
- **Project** 20 %
- **Exam #1 (Units 1-4)** 20 %
- **Exam #2 (Units 5 and 6)** 20 %
- **Exam #3 (Unit 7)** 15 %

**Quizzes** - There will be an open notes quiz posted almost every week during the first 2/3 of the course covering lecture material from the previous week.

**Homework** - Homework grades will two field assignments where students will be required to locate hydrologic indicators in a local wetland as well as determine the classification of a local wetland using the online National Wetlands Inventory and then visiting the wetland to confirm the classification.

**Participation** – Participation will be graded based on student participation in the weekly chat sessions held most Thursday evenings from 8-9:30.

**Project** –The project will consist of reviewing one of USEPA’s 13 Wetland Modules that were design to assist states and tribes in developing indices that will evaluate wetland condition as it relates to water quality and other stressors. Once the module is reviewed, the student will summarize the module in a PowerPoint presentation (or other suitable program) and record a narrative to go along with the slide presentation so that it can be distributed to the class for review. The student will then assist the instructor in leading a
discussion of the module during the chat session. Presentation grades will be based 50% on student review and 50% on instructor review using a grading rubric.

**Exams** – The first exam will cover units 1-4, the second exam will cover units 5-6 and the last exam will be an open book exam/paper on unit 7. For the last unit 7 exam the student will develop a monitoring plan that they believe would best determine the condition of wetlands within a fictitious geographic region. Information to support that plan will be based on their assessment of the USEPA Wetland Modules presented in Unit 7.

**Final letter grade:** The final letter grade for the course will be based on current UF policies that can be found at [https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx](https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx), and are outline below.

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**Late assignments:** All assignments are due by midnight on the date requested. Assignments that are late will result in an initial 5% reduction in grade with an additional 5% deduction per day the assignment is late.

**ONLINE COURSE EVALUATION PROCESS:**
Student assessment of the instructor and the course will be available at the end of the semester. Students are expected to provide feedback on the quality of instruction in the course using a standard set of university and college criteria. These evaluations are conducted online at [http://evaluations.ufl.edu](http://evaluations.ufl.edu). Evaluations are typically open for students to complete during the last two or three weeks of the semester. You will be notified of the specific times when they are open.

**COURSE OUTLINE:**

**Unit 1 Introduction**
1) Definition of wetland
   - Soil
   - Hydrology
   - Vegetation

2) Functions/Importance
- Water Quality
- Water Supply
- Habitat
- Food Web Connections
- Flood Control
- Fisheries
- Education
- Recreation

Unit 2: Hydrology
1) Hydrologic cycle
2) Precipitation
   - Atmospheric moisture, Phase changes, Calculating aerial average precipitation
3) Evaporation and Transpiration
   - Pan evaporation, Energy budget method, Evapotranspiration, Interception Through fall
4) Infiltration
   - Soil moisture, Infiltration methods
5) Groundwater
   - General properties, Groundwater movement, Surface connectivity
6) Water budget calculations
7) Tides
8) Rainfall runoff
   - Runoff processes: rational method, curve number approach, Hydrograph analysis, and Unit hydrograph theory
9) Flood probability and management
10) Floodplain Hydraulics
   - Flood routing and fluvial geomorphology, Regional riverine landscapes
11) Wetlands and riparian zones
12) Urban hydrology
   - IDF Curves, Peak Flows, Stormwater basins, Storage

Unit 3: Biogeochemistry
1) Upland vs. Wetland Soil Characteristics
2) Reduction/Oxidation
3) Energy transfer
4) Microbial activity
5) Electron Transport Phosphorylation
6) Oxygen
7) Carbon Cycling
8) Nitrogen Cycling
9) Phosphorus Cycling

Unit 4: Wetlands Vegetation
   Environmental Stressors
   - Inundation, anoxia, hypoxia, salts
   Biological Adaptations
     - Vascular Plants
Vegetative Succession
- Environmental forcing functions
- Hydarch succession
- Van der Valk's Environmental Sieve concept
- Environmental feedback loops and forcing functions
  - Roll of fire
  - Change in elevation due to sediment accumulation
  - Raised bogs
- Seed recruitment and establishment
  - Dispersal mechanisms
  - Seed banks

**Unit 5: Nutrient Dynamics in Wetlands and Watersheds**

**Abiotic Factors Regulating Nutrients**
- Hydrologic fluctuation
- Temperature
- Geology
- Hydrologic inputs
- Wind disturbance

**Biotic factors regulating nutrients**
- Vegetation uptake and cycling
- Microbial decomposition
- Megafauna contributions

**Unit 6: Water Quality Treatment Wetlands**

**Design considerations and Case Studies**
1) **Design options**
   - Surface flow, gravel bed, submerged aquatic, floating aquatic, vertical flow, horizontal flow,
2) **Design Equations**
3) **Vegetation**
   - Types, Exotics, Self-organization, Planting techniques
4) **Management Issues**
   - Performance, Wildlife, Mosquitoes, Sediments

**Unit 7: Measures of Wetland Condition – EPA Wetland Modules**
1. Introduction to Wetland Biological Assessment
2. Study Design for Monitoring Wetlands
3. Volunteers and Wetland Biomonitoring
4. Wetland Classification
5. Developing Metrics and Indexes of Biological Integrity for Wetlands
6. Biological Assessment Methods for Birds
7. Using Algae to Assess Environmental Conditions in Wetlands
8. Vegetation-Based Indicators of Wetland Nutrient Enrichment
9. Using Vegetation to Assess Environmental Condition in Wetlands
10. Biogeochemical Indicators
11. Using Amphibians in Bioassessment of Wetlands
12. Nutrient Load Estimation
13. Land Use Characterization for Nutrient and Sediment
UNIVERSITY POLICIES:

Academic Honesty:
As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity." You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment."

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code.

Software Use:
All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Services for Students with Disabilities:
The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation

0001 Reid Hall, 352-392-8565, www.dso.ufl.edu/drc/

Campus Helping Resources:
Students experiencing crises or personal problems that interfere with their general well-being are encouraged to utilize the university’s counseling resources. The Counseling& Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

• University Counseling &Wellness Center, 3190 Radio Road, 352-392-1575, www.counseling.ufl.edu/cwc/
Counseling Services
Groups and Workshops
Outreach and Consultation
Self-Help Library
Wellness Coaching

- *Career Resource Center*, First Floor JWRU, 392-1601, [www.crc.ufl.edu/](http://www.crc.ufl.edu/)