

# AOM 6736- Principles & Issues in Environmental Hydrology

## Fall 2022

**Fall 2022:** 3 credits

**Instructor:** Dr. Greg Kiker, Professor

Dept. of Agricultural and Biological Engineering, Rogers Hall

Phone (352) 294-6749; E-mail [gkiker@ufl.edu](mailto:gkiker@ufl.edu) Skype: gregkiker

Office Hours: By appointment and at least one live Zoom call per week

**Class Meeting Times:** This course is asynchronous through the Canvas course management system with no official meeting time unless set by the instructor for specific events.

**Online Guest Lecturer** Steve Leitman, Adjunct Prof. Urban and Regional Planning, Florida State University, Email: [leitman@tds.net](mailto:leitman@tds.net)

**Meeting Place:** The class is delivered online via Canvas (<https://elearning.ufl.edu/>).

Students are welcome to contact Dr Kiker through CANVAS email, his office phone (during business hours) or via cell (352)-281-1195. If I am not available, please leave a message with a phone number that I can use to call you. I try to return calls in 24 hours or less.

**Catalog Description:** This is a basic course in environmental hydrology intended for agricultural and natural resource managers. The first half of the course covers scientific principles of the hydrologic cycle while the second half investigates case studies of current water quality and water management issues.

**Course Materials:** There is no formal textbook for this course but all required readings will be posted on the online through Canvas. Additional course notes, web links, text and diagrams are also provided on this site. Additional materials may be provided at the discretion of the instructor.

**Prerequisites:** This course will use algebraic equations and trigonometry to estimate water and energy flows in the hydrological cycle. Sophomore level chemistry and physics as well as mathematics through Pre-Calculus are recommended, but not required. *Significant experience with Microsoft Excel or similar spreadsheets is required in this class for several homework assignments and for elements of the class project. Students will be expected to use and develop spreadsheet pages to calculate hydrological flows, performance measures and simulated water demands for different water users in selected watersheds. Students are welcome to phone the instructor to get more details on the types of calculations and spreadsheets required.*

**General Description:** This is a course in Environmental Hydrology intended for upper-division and graduate students in agriculture, environmental science and management.

This course offers an introduction to river basin management and planning by providing a foundation of understanding of river basins as a system from biological, hydrological and geopolitical viewpoints. Special emphasis will be focused on basic hydrology as well on the planning and management of transboundary basins (interstate and among countries). The class will have a special emphasis on ongoing management issues in the Apalachicola-Chattahoochee-Flint basin, a local river basin in the southeast USA. The class is designed to introduce students to technical tools and concepts used to understand and manage river basins from a system wide context including negotiation and math simulation tools. In addition, a basic hydrology section covers scientific principles of the hydrologic cycle including precipitation, evapotranspiration, infiltration, groundwater flow and surface runoff.

Through the Course Management System (E-Learning/Canvas), students will be required to respond to questions on reading assignments posted by the instructor and to sometimes comment on the responses of other students. In addition students are expected to participate in online discussions with both other students and with the instructor as are scheduled by the instructor. Specified times for online, live or phone discussions with instructor which are mutually acceptable to both the students and the instructor can be provided with the mutual agreement of the instructor and the student.

**CLASS OBJECTIVES:** At the close of this course, the student will be able to:

1. Analyze and calculate the basic flows within the hydrological cycle in terms of the quantities of water and energy that move within various states.
  - a. Complete simple hydrological calculations concerning general water cycle including energy, storage, precipitation, evaporation, surface and subsurface flows.
  - b. Explain the hydrological cycle as it relates to Florida's unique water resources
2. Describe the basic legal principles and conflict resolution alternatives that are relevant to transboundary river basin management
3. Integrate hydrological principles and river management objectives to negotiate and formulate water basin management contracts among opposing viewpoints
  - a. Demonstrate how reservoir systems can be used to manage water flows and consumptive uses within a complex watershed
  - b. Define and calculate environmental performance metrics for establishing tradeoffs between human uses and ecosystem protection.
  - c. Assume a specific, stakeholder role and negotiate water management alternatives within a role play setting.

**Course Outline and Schedule:** The course is divided into 12 modules. Most modules are designed to take one week to complete. Modules have varying content with recorded lectures, readings, case study assignments and a short, open book quiz. Case studies are calculational in nature and similar to homework assignments. As case studies are

automatically graded by CANVAS, students are allowed several attempts to calculate the correct answer, but each new attempt has altered number inputs so that all calculations must be redone. Each module's case study is due on Sunday midnight before the next module. If students require more than four attempts at a case study, they will need to contact the instructor via email. Each module will have an online Quiz (open from Friday 8 am until Sunday midnight).

The course will follow this **general** schedule (dates are subject to some small changes as needed for course continuity).

Module 0: Start Here: Introductions and Course Management System Basics (Week 1)

### **SECTION: 1 Principles of Hydrology and Water Resources Management**

Module 1: Introduction to the Hydrological Cycle and Water Budgets (Week 1)

Module 2: Solar Radiation as a fundamental input to the hydrological cycle (Week 2)

Module 3: Precipitation and Atmospheric Water- Expanded analysis of the hydrological cycle (Week 3)

Module 4: Evaporation and Transpiration- Expanded analysis of the hydrological cycle (Week 4)

Module 5: Infiltration and Runoff - Expanded analysis of the hydrological cycle (Week 5) (**Note – this is a large module with a higher work load than most**)

Module 6: Subsurface and Groundwater - Expanded analysis of the hydrological cycle (Week 6)

Module 7: Challenges in Florida Hydrology (Week 7)

### **SECTION: 2 Issues in Hydrology and Water Resources Management**

Module 8: Water Conflicts: real or imagined? Transboundary water resources and uses (Week 8)

Module 9: Introduction to the Apalachicola-Chattahoochee-Flint (ACF) River Basin (Week 9)

Module 10 The Apalachicola-Chattahoochee-Flint (ACF) River Basin as a human-managed system (Week 10)

Module 11: Simple Water Resource Management Simulation Models and their use in the ACF River Basin (Week 11)

Module 12: Negotiation as understanding: Role Play and Water Allocation trade-offs in the ACF Basin (Week 12-15) ***ACF Negotiation/Class Project***

**Readings:** Specific journal articles and government documents are listed in the weekly modules.

1. USGS: Water Budgets: Foundations for Effective Water-Resources and Environmental Management By Richard W. Healy, Thomas C. Winter, James W. LaBaugh, and O. Lehn Franke.

2. Zeitoun, Mark, and Jeroen Warner. "Hydro-hegemony-a framework for analysis of trans-boundary water conflicts." *Water policy* 8.5 (2006): 435-460.
3. Barnaby, Wendy. "Do nations go to war over water?." *Nature* 458.7236 (2009): 282-283.
4. Postel, Sandra L., and Aaron T. Wolf "Dehydrating conflict." *Foreign Policy* 126.September/October (2001): 60-67.
5. P. C. D. Milly, Julio Betancourt, Malin Falkenmark, Robert M. Hirsch, Zbigniew W. Kundzewicz, Dennis P. Lettenmaier, and Ronald J. Stouffer. 2008 Stationarity Is Dead: Whither Water Management?
6. Kundzewicz, Z. W., et al. "The implications of projected climate change for freshwater resources and their management." (2008): 3-10.
7. Leitman, Steven. "Apalachicola-Chattahoochee-Flint Basin: Tri-state Negotiations of a Water Allocation Formula'." *Adaptive Governance and Water Conflict: New Institutions for Collaborative Planning*, Ed. JT Scholz and B. Stiftel, Resource for the Future, Washington DC (2005): P 74-88.
8. Ruhl, J. B. "Water Wars, Eastern Style: Divvying Up the Apalachicola-Chattahoochee-Flint River Basin." *Journal of Contemporary Water Research & Education* 131.1 (2005): 47-54.
9. Feldman, David Lewis. "Barriers to adaptive management: Lessons from the Apalachicola–Chattahoochee–Flint compact." *Society and Natural Resources* 21.6 (2008): 512-525.
10. Postel, S. 2016. How Smarter Irrigation Might Save Rare Mussels and Ease a Water War.
11. How Much Water Is in the Apalachicola, Chattahoochee, and Flint Rivers, and How Much Is Used? USGS Fact Sheet 2007.
12. McMahon, George F. "Models and realities of reservoir operation." *Journal of Water Resources Planning and Management* 135.2 (2009): 57-59.
13. Reservoir Management in the Apalachicola-Chattahoochee-Flint Basin. By Steve Leitman (2004)
14. Richter, Brian D., et al. "A collaborative and adaptive process for developing environmental flow recommendations." *River research and applications* 22.3 (2006): 297-318.

15. Bunn, Stuart E., and Angela H. Arthington. "Basic principles and ecological consequences of altered flow regimes for aquatic biodiversity." Environmental management 30.4 (2002): 492-507

**TERM PROJECT:** A term project will consist of a case study negotiation focusing on multi-disciplinary aspects of water use in the Apalachicola/Chattahoochee/Flint Basin. Generally, the term project grade will be divided into three sections: (1) Preparation for the negotiation through a strategy document and related spreadsheet calculations, (2) Actual performance in the negotiation period with other role players, and (3) Product of the negotiated settlement (or lack of one) along with an “after action review” survey/report.

This term project will have a spreadsheet tool developed for use in the negotiations. Students will use this spreadsheet to explore the ramifications of various flow and release scenarios to their associated constituencies. Additional lectures and educational opportunities may be available for interested/qualifying students. Each student will turn in individual written report (s) with referencing on each section.

**GRADING:**

Case study calculation assignments (approximately 8) (30%)

On-line Graded Discussions and surveys (5%)

Module Quizzes (approximately 11) covering reading material/lectures (25%)

Term Project on the Apalachicola/Flint/River (40%)

- Written strategy document, performance metrics and spreadsheet calculations (35% of term project grade)
- Performance in the role play (35% of term project grade)
  - Assessment from your role play peers (30%)
  - Quality of your flow negotiations as proposed, accepted or rejected (35%)
  - Instructors’ assessment of your role play performance (35%)
- Written report on the overall role play/negotiation process (30% of term project)
- *Note: additional lectures and Term Project guidance will be given in class and on Canvas*

For information on current UF policies for assigning grade points, see

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

**Class participation through discussion and interactions is strongly encouraged**

- Case studies with calculations are assigned for selected modules. Students will have 6 days to complete the assignments.
- On-line discussions (graded and ungraded) will be assigned in selected modules.
- All module quizzes will be posted through the E-Learning/Canvas Course Management System.

- Late assignments will not be accepted without prior arrangement or medical documentation.
- There will be no make-up quizzes unless scheduled at least 48 hours in advance with the instructor.
- Additional class interaction events may be organized by the instructor
- 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.

**Additional academic work and class responsibilities are assigned to those enrolled in the graduate version of this course.**

- **Within the ACF negotiation (Class Project) graduate students strategy document will include strategy elements for all negotiating roles instead of only one role.**
- **Within the ACF negotiation (Class Project) graduate students' ACF spreadsheet flow negotiation submissions must include the best and least acceptable flow regime for ALL ten negotiating roles.**
- **Graduate students will be expected to moderate and lead online discussions/negotiations for their assigned ACF negotiation group. If two graduate students are assigned to a group, then they will share moderator duties. Dr Kiker will provide all instructions on how to moderate discussions.**

### **GRADING SCALE;**

A: $93 \leq \text{Average} \leq 100;$	A-: $90 \leq \text{Average} < 93$
B+: $87 \leq \text{Average} < 90;$	B : $83 \leq \text{Average} < 87;$ B- : $80 \leq \text{Average} < 83;$
C+: $77 \leq \text{Average} < 80;$	C : $73 \leq \text{Average} < 76;$ C- : $70 \leq \text{Average} < 73;$
D+: $67 \leq \text{Average} < 69;$	D : $63 \leq \text{Average} < 67;$ D- : $60 \leq \text{Average} < 63;$
E : $\leq \text{Average} = < 60$	

More information on UF grading policy may be found at:

[UF Graduate Catalog](#)  
[Grades and Grading Policies](#)

### ***Students Requiring Accommodations***

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

### ***Course Evaluation***

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

### **In-Class Recording**

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

### ***University Honesty Policy***

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students 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.” The Honor Code (<https://sccr.dso.ufl.edu/process/student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible

sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

### ***Commitment to a Safe and Inclusive Learning Environment***

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Jennifer Nappo, Director of Human Resources, 352-392-0904, [jpennacc@ufl.edu](mailto:jpennacc@ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto:nishida@eng.ufl.edu)

### ***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. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

### ***Student Privacy***

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

### ***Campus Resources:***

#### ***Health and Wellness***

##### **U Matter, We Care:**

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact [umatter@ufl.edu](mailto:umatter@ufl.edu) so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

**Counseling and Wellness Center:** <https://counseling.ufl.edu>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

**Sexual Discrimination, Harassment, Assault, or Violence**

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the [\*\*Office of Title IX Compliance\*\*](#), located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto:title-ix@ufl.edu)

**Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

**University Police Department** at 392-1111 (or 9-1-1 for emergencies), or

<http://www.police.ufl.edu/>.

**Academic Resources**

**E-learning technical support**, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. <https://lss.at.ufl.edu/help.shtml>.

**Career Connections Center**, Reitz Union, 392-1601. Career assistance and counseling; <https://career.ufl.edu>.

**Library Support**, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <https://teachingcenter.ufl.edu/>.

**Writing Studio, 302 Tigert Hall**, 846-1138. Help brainstorming, formatting, and writing papers. <https://writing.ufl.edu/writing-studio/>.

**Student Complaints Campus:** <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>; <https://care.dso.ufl.edu>.

**On-Line Students Complaints:** <https://distance.ufl.edu/state-authorization-status/#student-complaint>.