CEE 432 – STREAM ECOLOGY
FALL 2019

Description of physical, biological, and chemical characteristics in streams and rivers including an integrated treatment of the environmental factors affecting the composition and distribution of biota; emphasizes the application of ecological engineering principles in aquatic ecosystem protection and management.

COURSE INFORMATION:

Course:	**CEE 432 – Stream Ecology**
Department:	Civil and Environmental Engineering
Meeting time:	Mondays & Wednesdays, 11:00-12:20
Meeting location:	TBD
Credits:	3 Undergraduate hours, 4 Graduate hours
Prerequisites:	Consent of instructor

Instructor:	Rafael O. Tinoco, Ph.D. Assistant Professor Department of Civil and Environmental Engineering University of Illinois at Urbana-Champaign 205 N. Mathews Ave 2514 Ven Te Chow Hydrosystems Laboratory Urbana, IL 61801 Office phone number: (217) 265-6931 Email: tinoco@illinois.edu
Office hours:	TBD
Contact:	Email strongly preferred, I'll get back to you by the end of the day at the latest (8:00 - 17:00).

COURSE DESCRIPTION:

The course will introduce students to critical issues in stream and watershed ecology with an emphasis on the physical and chemical mechanisms affecting the organism distribution and success in stream ecosystems. Fundamentals of fluid mechanics, morphodynamics, ecology and modern community ecology will be reviewed and applied to running water environments. The students will focus on habitat studies, at both macro- and micro-scale, from a physical-chemical perspective, leveraging their understanding of watershed quantification and channel description to discuss water chemistry and quality, to identify factors affecting fate and transport of organisms in stream ecosystems. Basic ecological theory will be used to study community organization, production, the role of biota as ecosystem engineers, as well as organic matter and mineral cycling. The students will apply the physical, chemical and biological tools and understanding developed throughout the course in the context of watershed protection approaches, modern management and regulation, with an emphasis on watershed classification and landscape ecology issues, as well as recent advances in the use of ecologically based analysis approaches in stream management. The course includes hands-on laboratory sessions at the Ven Te Chow Hydrosystems Laboratory and field experiments on local natural waters.

LEARNING GOALS:

Upon completion of the course the students will:

- Identify critical issues for management, protection and restoration of natural running waters.
- Identify and characterize the physical, chemical and biological processes affecting organism success and distribution in stream ecosystems.
- Develop the skills to represent such processes analytically and using simple numerical methods.
- Apply and integrate basic ecological theory to assess the impact of biota as ecosystem engineers.
- Design, conduct and evaluate laboratory experimental studies and field campaigns using state-of-the-art measurement and surveying equipment and techniques.
- Apply their understanding of the fundamental processes and their interactions to stream restoration and naturalization projects.

COURSE MECHANICS:

Information will be disseminated primarily via the website. Announcements will also be made during lectures, but it is the students' responsibility to check it often.

https://sites.google.com/a/illinois.edu/cee432-2019/

- **Lecture**: Notes and presentation slides will be posted online prior and after each class.
- **Exams**: One mid-term and one final exam will be conducted. They will be comprised of an in-class quiz (30minutes) to evaluate basic understanding of the concepts and a take home component to synthesize, integrate, and apply the knowledge developed throughout the course.
- **Assignments**: Six problem sets will be assigned during the course. You are encouraged to work with fellow students but the final write-up must be individual and show your own work. All assignments are due at the **beginning** of the class. No late assignments will be accepted unless for a justifiable, documented family/medical emergency. If you will be traveling or have any conflicts with the schedule, please let me know well before the deadline.
- **Experiments**: We will conduct experiments during class, at the Ven Te Chow Hydrosystems Laboratory, and in local natural waters. Participation is mandatory and data from those experiments will be used in your homework assignments. An individual, brief and concise report is required for each experiment. Specific guidelines will be provided on the website.
- **Final Project (For Graduate students, 4-hour option)**: You will work on teams on an independent project due at the end of the semester. Specific guidelines will be provided separately. You will need to incorporate parts of the analysis conducted during your HW assignments, so make sure you write any computer code from the HWs on a way that will make it easier for you to reuse / modify it for your final project.
- **Attendance and participation**: Students are expected to attend and actively participate during class discussions. As engineers and scientists you should be able to communicate and express your ideas in both technical and layman terms, and class participation is a unique way to practice such skills.

LEARNING RESOURCES:

a) Readings

The textbook for the course is:

- Allan, D. & Castillo, M., "Stream Ecology: Structure and Function of Running Waters", 2nd Edition, Springer 2007.

Notice the e-book version is available from the University Library, so **no purchase is required**.

Other relevant texts for the course are:

- Hauer, F.R. & Lamberti, G.A., "Methods in Stream Ecology", 2nd edition, Academic Press, 2007.
- Wood, P.J., Hannah, D.M., & Sadler, J.P (eds), "Hydroecology and Ecohydrology: Past, present and future", John Wiley & Sons, 2007.

Both are also available as e-books through the University Library.

Additional material and journal articles will be assigned throughout the semester.

b) Software

Assignments will require use of computer analysis software. While you are free to use any type of software, some of the problems and solutions will be generated using Mathworks MATLAB. We strongly encourage you to use either MATLAB, computational languages such as Fortran, C, or other Matlab-like, open source alternatives (e.g., Python, Octave, FreeMat). We can't provide assistance on installation or use of the abovementioned software, but you can find plenty of online tutorials, such as the ones posted on the course website.

GRADING

Grading will be based on an absolute (no curved) scale with the following criteria:

	3h option	4h option
Problem sets	40%	30%
Experiments (active participation and reports)	15%	15%
Mid-term exam	20%	15%
Final exam	20%	15%
Attendance and class participation	5%	5%
Team project	---	20%
Total	**100%**	**100%**

Letter grades will be assigned as follows:

A	93.0 - 100%
A-	90.0 - 92.9%
B+	87.0 - 89.9%
B	83.0 – 86.9%
B-	80.0 – 82.9%
C+	77.0 – 79.9%
C	73.0 – 76.9%
C-	70.0 – 72.9%
D+	67.0 – 69.9%
D	63.0 – 66.9%
D-	60.0 – 62.9%
F	00.0 – 59.9%

List of Topics:

Week	Lecture
1	Introductory class: Streams and aquatic organisms
2	Lotic habitats and ecology. A geomorphic perspective: Landscapes/Watersheds
3	Channels and flow
4	Fluvial geomorphology
5	Stream water chemistry. Nutrient dynamics
6	Physical and biological time in streams, water quality
7	Basic ecological theory of streams
8	Organic matter and trophic relationships: Plants – periphyton, phytoplankton, macrophytes
9	Microinvertebrates - Macroinvertebrates
10	Fish: movement, predation, grazing, and competition
11	Ecological explorations
12	Urban streams, regulated rivers
13	Restoration, naturalization
14	Fall break
15	Watersheds – short and long-term management strategies
16	Final project presentations

COURSE POLICIES

Student Code of Academic Integrity

Each student in this course is expected to abide by the University Student Code of Academic Integrity.

http://studentcode.illinois.edu/article1_part4_1-401.html

A quick guide is provided in:

https://provost.illinois.edu/policies/policies/academic-integrity/students-quick-reference-guide-to-academic-integrity/

All academic integrity infractions will be dealt with according to the Code, regardless of whether a student has actually read it. Cheating, Plagiarism, Fabrication, Facilitating infractions of academic integrity, Bribes, Favors, Threats, and Academic interference will not be tolerated. Ignorance of the Code is not a valid justification.

Accessibility

To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES, you may visit 1207 S. Oak St., Champaign, call 333-4603, e-mail disability@illinois.edu or go to the DRES website (http://disability.illinois.edu/). If you are concerned you have a disability-related condition that is impacting your academic progress, there are academic screening appointments available on campus that can help diagnose a previously undiagnosed disability by visiting the DRES website and selecting "Sign-Up for an Academic Screening" at the bottom of the page.

Emergencies

The University of Illinois, through the Office of Campus Emergency Planning provides resources, guidance and training for emergency situations (like fire, severe weather or if someone is trying to hurt you). You can learn about such resources at:

http://police.illinois.edu/emergency/

as well as through the Campus Administrative Manual:

http://cam.illinois.edu/#emergencysummary

The Campus Administrative Manual also deals with the issue of Campus Violence Threat Assessment, and encourages you to report suspicious behaviors. You can find the policy and contacts at:

http://cam.illinois.edu/v/V-C-14.htm

Important dates

Check the calendar at: https://registrar.illinois.edu/fall-academic-calendar-19 for deadlines to add and drop courses, as well as elect and change credit/no credit options.

Attendance and participation

Attendance, punctuality, and active participation are required and are part of the final grade.

Use of electronics

Photographs, audio and video recording is not allowed during lectures. Use of cell phones, laptops and tablets for purposes not related to the lecture is not allowed.