

Introduction to Stream Solute Tracer Measurements & Modeling

SPEA-E 702

Fall 2019 Semester

Lecture: MW 15:30-17:00

INSTRUCTOR: Adam S. Ward, Ph.D., P.E.
OFFICE: 418 MSB-II
EMAIL: adamward@indiana.edu
PHONE: 812-856-4820
OFFICE HOURS: Interactive discussion boards, Emails

TEXT: Readings assigned each lecture

GRADING:	Online Introduction	10%
	Homework (2 assignments)	60%
	Student Presentations	30%

Final grades will be based on the weighted average outlined above and assigned using the following grading scale:

- $A+ \geq 100\%$
- $A \geq 92\%$
- $92 > A- \geq 90\%$
- $90 > B+ \geq 88\%$
- $88 > B \geq 82\%$
- $82 > B- \geq 80\%$
- $80 > C+ \geq 78\%$
- $78 > C \geq 72\%$
- $72 > C- \geq 70\%$
- $70 > D \geq 60\%$
- $60 > F$

LEARNING OBJECTIVES

The primary goal of this course is to provide students an understanding of how to execute and interpret stream solute tracer studies. Specific objectives include the ability to correctly calculate and interpret tracer studies with approaches including temporal moments, channel water balance, breakthrough curve decomposition, StorAge Selection functions, transient storage models, and additional techniques. Students will demonstrate a conceptual understanding of the strengths and weaknesses of each approach, and how they complement one another, in analysis of stream solute tracer data.

PREREQUISITES

The prerequisites for this course are one upper-division course in water resources, and a willingness to learn. Students will need to execute calculations in a

CLASS MANAGEMENT

All course materials and web postings will be made using the Canvas course management software. You are responsible to regularly login to check course announcements,

download lecture materials, and access posted information.

INTRODUCTIONS

Each student should upload a short introduction video to the group discussion board. Your video should be 60-90 seconds, introducing yourself to the class. Please include your name, institution, degree program, and anything else you would like to share.

HOMEWORK

Three assignments, equally weighted. Each includes critiques of the reading from the previous week. Deadlines for homework assignments are...

- Homework #1 - Due 18-Sept
- Homework #2 - Due 30-Sept

STUDENT PRESENTATIONS

Students will work in teams of 2-3 students (from different institutions!) to deliver a half-lecture to their colleagues. Teams will self-organize and select one of the following papers. Each group is responsible to teach the class: (1) the key concepts (2) how to execute and interpret the calculations; (3) review at least one other paper that uses this approach; and (4) provide a reading list of other additional papers.

1. Drummond, J. D., T. P. Covino, A. F. Aubeneau, D. Leong, S. Patil, R. Schumer, and A. I. Packman (2012), Effects of solute breakthrough curve tail truncation on residence time estimates: A synthesis of solute tracer injection studies, *J. Geophys. Res.*, 117, G00N08, doi: 10.1029/2012JG002019.
2. Covino Timothy P. , McGlynn Brian L. , McNamara Rebecca A. , (2010), Tracer Additions for Spiraling Curve Characterization (TASCC): Quantifying stream nutrient uptake kinetics from ambient to saturation, *Limnol. Oceanogr. Methods*, 8, doi:10.4319/lom.2010.8.484.
3. Wlostowski, A. N., Gooseff, M. N., Bowden, W. B. and Wollheim, W. M. (2017), Stream tracer breakthrough curve decomposition into mass fractions: A simple framework to analyze and compare conservative solute transport processes. *Limnol. Oceanogr. Methods*, 15: 140-153. doi:10.1002/lom3.10148
4. Boano, F., A. I. Packman, A. Cortis, R. Revelli, and L. Ridolfi (2007), A continuous time random walk approach to the stream transport of solutes, *Water Resour. Res.*, 43, W10425, doi: 10.1029/2007WR006062.

MISC. BUISINESS

Please respect your fellow students by arriving on time, keeping conversations focused on the material, and keeping other work minimized during lecture.

If you find yourself having difficulty early in the module please reach out to me ASAP. I enjoy office hours and helping students understand the material. Often times a few conversations to help explain the material in another way is all that students need to be highly successful in this course.

Feel free to email me with questions related to lecture, homework, or in class exercises. Please do understand that I will attempt to reply in a reasonable amount of time (48-hours in most cases), but that the reply may not be immediate. Please practice

professionalism in your communications via email; this will be required in your future careers and now is a good time to start.

For help with homework assignments or to discuss course material in greater detail, office hours are highly encouraged (as opposed to emailed questions). The learning process in this course is centered around your effort. I am happy to help you master the material, but note that explanations via email are difficult and can lead to more confusion than help in some cases.

COURSE SCHEDULE & READING ASSIGNMENTS

Lecture No.	Day	Date	Topic	Required Reading (ahead of class)
1	W	4-Sep	Introduction & Field Methods	Stream Solute Workshop, 1990
2	M	9-Sep	Short-term storage	Ward et al., 2018
3	W	11-Sep	Channel Water Balance, SAS	Payn et al., 2009
4	M	16-Sep	Transient Storage Model I	Bencala and Walters, 1983
5	W	18-Sep	Transient Storage Model II & Intro to Reactive Tracers	Newbold et al., 1981
6	M	23-Sep	Reactive Tracers	Haggerty et al., 2008
7	W	25-Sep	Student Presentations	Skim papers not responsible for presenting
8	M	30-Sep	Student Presentations	Skim papers not responsible for presenting

SPEA ACADEMIC POLICIES

Academic Dishonesty

SPEA faculty do not tolerate cheating, plagiarism, or any other form of academic dishonesty. If you have not done so, you should read the IUB *Code of Student Rights, Responsibilities, and Conduct*, which can be accessed at <http://www.iu.edu/~code/code/index.shtml> so you will be sure to understand what these terms mean and what penalties can be issued for academic dishonesty. Academic dishonesty can result in a grade of F for the class (an F for academic dishonesty cannot be removed from the transcript). Significant violations of the Code can result in expulsion from the University.

Plagiarism is using another person's words, ideas, artistic creations, or other intellectual property without giving proper credit. According to the *Code of Student Rights, Responsibilities, and Conduct*, a student must give credit to the work of another person when he/she does any of the following:

- a. Quotes another person's actual words, either oral or written;
- b. Paraphrases another person's words, either oral or written;
- c. Uses another person's idea, opinion, or theory; or
- d. Borrows facts, statistics, or other illustrative material, unless the information is common knowledge.

Civility

Civility is important in an academic community to ensure that all parties—students, staff, and faculty—are working in an environment that fosters achievement of the individual's and community's goals and objectives. Civility requires all parties to demonstrate personal integrity and conduct themselves in a manner that shows respect, courtesy and tolerance to others. Examples of discourteous behaviors during class include reading the newspaper, listening to headphones, talking or laughing with others, chronically arriving late, and so forth. These behaviors are distracting to the instructor and classmates, and SPEA faculty will address these problems as they arise. Maintaining and fostering civility inside and outside the classroom is especially important to SPEA, which is a professional school.

Pursuant to the Indiana University Student Code of Conduct, disorderly conduct which interferes with teaching, research, administration, or other university or university-authorized activity will not be tolerated and will be immediately reported to the Office of The Dean of Students for appropriate disposition which may result in disciplinary action including possible suspension and/or expulsion from the university.

Communication between Faculty and Students

In order to verify the identity of all parties involved, effective September 1, 2004, all email communication from current SPEA students to SPEA staff must originate from an Indiana University email account. For email communication with SPEA faculty, current SPEA students should refer to course syllabi for instructors' preferences (Canvas, email, etc.). This policy applies to current students only. Instructions for forwarding your IUB email to another account can be found at:

<http://kb.indiana.edu/data/beoj.html?cust=687481.87815.30>

Course Withdrawals

Students who stop attending class without properly withdrawing from the class may receive a grade of F. It is important to withdraw from a course within specified timeframes (see chart below). Note that withdrawals after Week 12 of a regular session or Week 4 of a summer session are rarely granted. **Poor performance in a course is not grounds for a late withdrawal.**

No withdrawal forms will be processed in the Office of the Registrar after the last day of classes. Any requests for a late withdrawal after the last day of classes must go through the grade appeal process, but each student should remember that in accordance with campus policy, SPEA does not permit a student to withdraw from a course if he/she has completed the course requirements. Grade replacement should be used in this case. To

withdraw, obtain a withdrawal slip (DROP/ADD Form) from the SPEA Student Services window. Instructions for completing it are given on the form.

Withdrawal Deadlines	
Course deleted from record, no grade assigned, 100% refund (Advisor signature IS NOT required)	Week 1 (last day)
Withdrawal with automatic grade of W (Advisor signature IS required)	Week 2– Week 7 (regular session) Week 2 – Week 3 (summer session)
Withdrawal with grade of W or F (Advisor and instructor signatures ARE required)	Week 8 – Week 12 (regular session) Week 3 – Week 4 (summer session)

Incompletes

A grade of incomplete (I) indicates that a ‘substantial portion’ of the work in a course has been satisfactorily but not entirely completed by the student as of the end of the semester. The incomplete can be given to a student facing a hardship such that it would be unjust to hold the student to the established time limits for completing the work. To be eligible for the incomplete in a SPEA course, the student’s work must be of passing quality, and the student must have completed 75% of the course requirements. **Poor performance in a course is not grounds for an incomplete.** SPEA follows the campus guidelines in awarding incompletes which may be accessed at the Office of the Registrar’s website at:

http://registrar.indiana.edu/stu_grades.shtml

Incompletes must be removed within a time period not to exceed one year after the semester in which the student was enrolled in the course. The incomplete will revert to an ‘F’ if the work is not completed within the allotted timeframe established by the instructor.

Students Called to Active Duty

SPEA encourages any student who is in the Indiana Military Reserves and is called to active duty to finish his/her coursework if at all possible. Students who cannot complete their courses have the option of withdrawing with 100% fee refund, but this request must be made within one week of being called to active duty. Students who are called to active duty may qualify for an incomplete (provided that all the above criteria have been met). For further information, please see the Office of the Registrar’s website at:

http://registrar.indiana.edu/stu_infopoli.shtml

Final Exam Schedule

If a final exam is given, it must be held on the day and time set in the final exam schedule. If an instructor has changed the final exam date, the student should first consult with the instructor. Students who have more than three final exams in one day or insufficient time to get from one exam to another should consult with their instructors to resolve these conflicts. Exams may not be given in the week before the final exam week. If a student is not able to resolve a final exam problem with the instructor, the student may report the problem to the Director of Undergraduate or Graduate programs. The final exam week schedule can be found at the Office of the Registrar’s website at:

http://registrar.indiana.edu/stu_calsche.shtml

Counseling and Psychological Services

For information about services offered to students by CAPS:

<http://healthcenter.indiana.edu/counseling/index.shtml>

Disability Services for Students

For information about support services or accommodations available to students with disabilities, and for the procedures to be followed by students and instructors:

<https://studentaffairs.indiana.edu/disability-services-students/>

Sexual Harassment.

As your instructor, one of my responsibilities is to help create a safe learning environment on our campus. Title IX and our own Sexual Misconduct policy prohibit sexual misconduct. If you have experienced sexual misconduct, or know someone who has, the University can help.

If you are seeking help and would like to speak to someone confidentially, you can make an appointment with:

- i. The Sexual Assault Crisis Service (SACS) at 812-855-8900
- ii. Counseling and Psychological Services (CAPS) at 812-855-5711
- iii. Confidential Victim Advocates (CVA) at 812-856-2469
- iv. IU Health Center at 812-855-4011

For more information about available resources:

<http://stopsexualviolence.iu.edu/help/index.html>

It is also important to know that federal regulations and University policy require me to promptly convey any information about potential sexual misconduct known to me to our campus' Deputy Title IX Coordinator or IU's Title IX Coordinator. In that event, they will work with a small number of others on campus to ensure that appropriate measures are taken and resources are made available to the student who may have been harmed. Protecting a student's privacy is of utmost concern, and all involved will only share information with those that need to know to ensure the University can respond and assist. I encourage you to visit the following resource to learn more:

<http://stopsexualviolence.iu.edu/help/index.html>