

# **WATER 390/590: Water Chemistry and Analysis**

**Fall Semester 2022**

## **SYLLABUS**

### **Course Information:**

Credits: 4

Prerequisite: CHEM 106 or 117, and CNR or Biology major

### **Lecture**

Time: Monday, Wednesday, Friday 12:00-12:50 pm

Lecture Location: TNR 255

### **Lab**

Times:

Section 1: Wednesday 9:00 am – 10:50 am

Section 2: Tuesday 12:00 pm – 1:50 pm

Section 3: Wednesday 2:00 pm – 3:50 pm

Lab Location: 261 Trainer Natural Resources Building

### **Instructor Information:**

Dr. Kyle Herrman

Email: Kyle.Herrman@uwsp.edu (*preferred contact method*)

Office: 263 Trainer Natural Resources Building

Office Phone: 715-346-4832

### **Office Hours:**

Time: Thursday 10:00 am – 11:00 am or by appointment. If needed Zoom appointments can be setup in lieu of meeting in my office. Please send an email if a virtual meeting is needed.

## Course Objective:

The objective of this class is to expose students to the principles of water chemistry in human dominated landscapes. This will be accomplished using direct instruction methods during lecture and hands-on experience in the lab and in the field. In addition, you will learn how to create a well-organized scientific paper that addresses water chemistry data using statistics and citations from peer reviewed journal articles. After completing this course a student will be able to interpret the water chemistry data from an aquatic ecosystem and be able to properly collect, prepare, and process water samples for analysis. We will cover a variety of topics ranging from thermodynamics to unit conversion to carbonate chemistry so it is vital that students stay up to date on lecture topics and seek help if they are unsure of any course material. DO NOT wait until the last minute to get help because all of the material we will cover throughout the semester is comprehensive.

### Learning objectives:

- Describe how chemical, physical, and biological characteristics can influence water chemistry in aquatic ecosystems
- Develop quantitative, statistical, and analytical skills integral to water resources
- Properly collect, process, preserve, and analyze water samples
- Recognize the role of water chemistry and how it is used to evaluate aquatic ecosystems
- Create an articulate, grammatically correct, and well-organized technical paper in which data is presented with statistics and citations are used to justify findings
- Describe how water chemistry evolves throughout the hydrologic cycle with particular attention to delivery to surface water bodies

## Required text:

None. The book assigned at the bookstore is a text that will help you with basic chemistry concepts if you need a refresher.

## Grades:

### Scale:

A	93-100	C	73-76
A-	90-92	C-	70-72
B+	87-89	D+	67-69
B	83-86	D	63-66
B-	80-82	D-	60-62
C+	77-79	F	<60

## Assignments:

	<u>Points</u>	<u>Percent of Total</u>
Exams (6)		
Unit conversion and DO	20	8%
Redox chemistry	20	8%
Nutrients and mass balance	20	8%
Thermodynamics and acid/base	20	8%
Carbonate chemistry and precipitation/dissolution	20	8%
Mercury and organic contaminants	20	8%
Lab		
Lab Reports (5)	50	21%
Statistics Worksheet	10	4%
Watershed Description	10	4%
Technical Paper	50	21%

## **Complications related to COVID:**

As we enter into the semester there are a lot of unknowns related to COVID. There is the chance that at some point this semester you will have to miss class due to the following: positive diagnosis for COVID, quarantine notification from Health and Human Services, or feeling ill and awaiting test results. In each of these cases it is critical you do the following: as soon as possible email your instructors (lab and lecture instructor), indicate in this email why you are missing class, which classes (lab, lecture, etc.) you will not be present for, and the dates of the classes you will be required to miss. After assessing the situation your instructors will inform you the best way to make up any class time that you have missed or if any extensions for assignments, quizzes, or exams. If you do not inform your instructors of the situation in a complete and timely manner it will be impossible for us to help you with the material you have missed.

## **Homework:**

There will be no homework assignments due for credit in this class. There will be multiple practice examples posted on the class website and this will give you more opportunities to practice prior to exams. It will be up to you to stay current with material and seek help if you are not understanding concepts.

## **Exams:**

You will complete multiple exams throughout the semester and they will consist of multiple choice, calculation, and short answer questions. Exams will not be graded on a curve, but partial credit will be given as long as the student clearly answers questions in an organized manner that I can follow. Also, your exams will be open notes. However, you must review your notes prior to the exam and study beforehand or you will NOT have enough time to complete your exam. You will be given the 50-minute class period to complete your exam on the days outlined in the syllabus schedule. If you are going to miss an exam you must approach me with a valid excuse as to why you need to be absent. If approved, then an alternative exam or exam date will be determined.

### **Lab Reports:**

For a few of our labs this semester I will be assigned a brief lab report summarizing your findings from lab. These are not onerous assignments and as long as you actively participate in lab that week you should be to successfully complete the assignment.

### **Technical Paper:**

Based on the data collected by past semesters of this class you will complete a technical document this semester (see Writing Assignment document for more details). You will be required to analyze data, prepare figures and tables, and make informed arguments regarding the connection between land use and water chemistry for local streams in central Wisconsin. Before this report is due there will be 2 assignments you must complete on statistics and watershed descriptions. Both of these assignments are directly related to your lab report and will better prepare you to complete the report. It is important that you keep up with these assignments as their successful completion will result in higher grade on your lab report.

### **Graduate Student Requirements:**

Graduate students will have to complete a 10-page paper where they must compare the water chemistry between Mill Creek and the Plover River. There is a minimum of 8 citations from peer reviewed scientific journals references for this assignment. More details will be given later in the semester regarding format and style.

### **Classroom Civility:**

Any successful learning experience requires mutual respect on the part of the student and the instructor. Neither instructor nor student should be subject to others' behavior that is rude, disruptive, intimidating, or demeaning. The instructor has primary responsibility for and control over classroom behavior and maintenance of academic integrity.

### **Inform Your Instructor of Any Accommodations Needed:**

If you have a documented disability and verification from the Disability and Assistive Technology Center and wish to discuss academic accommodations, please contact your instructor as soon as possible. It is the student's responsibility to provide documentation of disability to Disability Services and meet with a Disability Services counselor to request special accommodation before classes start.

The Disability and Assistive Technology Center is located in 609 Albertson Hall and can be contacted by phone at (715) 346-3365 (Voice) (715) 346-3362 (TDD only) or via email at [datctr@uwsp.edu](mailto:datctr@uwsp.edu) or [datctr@uwsp.edu](mailto:datctr@uwsp.edu)

### **Statement of Policy**

UW-Stevens Point will modify academic program requirements as necessary to ensure that they do not discriminate against qualified applicants or students with disabilities. The modifications should not affect the substance of educational programs or compromise academic standards; nor should they intrude upon academic freedom.

Examinations or other procedures used for evaluating students' academic achievements may be adapted. The results of such evaluation must demonstrate the student's achievement in the academic activity, rather than describe his/her disability.

If modifications are required due to a disability, please inform the instructor and contact the Disability and Assistive Technology Center in 609 ALB, or (715) 346-3365.

### **Commit to Integrity:**

As a student in this course (and at this university) you are expected to maintain high degrees of professionalism, commitment to active learning and participation in this class and also integrity in your behavior in and out of the classroom.

### **UWSP Academic Honesty Policy & Procedures:**

Student Academic Disciplinary Procedures

UWSP 14.01 Statement of principles

The board of regents, administrators, faculty, academic staff and students of the university of Wisconsin system believe that academic honesty and integrity are fundamental to the mission of higher education and of the university of Wisconsin system. The university has a responsibility to promote academic honesty and integrity and to develop procedures to deal effectively with instances of academic dishonesty. Students are responsible for the honest completion and representation of their work, for the appropriate citation of sources, and for respect of others' academic endeavors. Students who violate these standards must be confronted and must accept the consequences of their actions.

UWSP 14.03 Academic misconduct subject to disciplinary action.

(1) Academic misconduct is an act in which a student:

- (a) Seeks to claim credit for the work or efforts of another without authorization or citation;
- (b) Uses unauthorized materials or fabricated data in any academic exercise;
- (c) Forges or falsifies academic documents or records;
- (d) Intentionally impedes or damages the academic work of others;
- (e) Engages in conduct aimed at making false representation of a student's academic performance; or
- (f) Assists other students in any of these acts.

(2) Examples of academic misconduct include, but are not limited to: cheating on an examination; collaborating with others in work to be presented, contrary to the stated rules of the course; submitting a paper or assignment as one's own work when a part or all of the paper or assignment is the work of another; submitting a paper or assignment that contains ideas or research of others without appropriately identifying the sources of those ideas; stealing examinations or course materials; submitting, if contrary to the rules of a course, work previously presented in another course; tampering with the laboratory experiment or computer program of another student; knowingly and intentionally assisting another student in any of the above, including assistance in an arrangement whereby any work, classroom performance, examination or other activity

is submitted or performed by a person other than the student under whose name the work is submitted or performed.

**Attendance:**

If you are going to miss an assigned due date for an excused purpose please contact me as soon as possible. If you have a documented absence then due dates can be extended. However, if you do not have an approved excuse for your absence then the appropriate late policies will be applied.

**Late Policy:**

Assignments are considered late if they are not turned in at the time listed on the assignment. I will however allow assignments to be turned in late, but 1 point will be taken off for each day the assignment is late. Exams must be completed by the time and day specified. If an exam is taken late 2 points will be taken off for each day, it is late.

**Tentative Schedule (could change as semester progresses):****Lecture Schedule**

<b>Date</b>	<b>Lecture Topic</b>
Sep 7	Syllabus and Water Basics
Sep 9	Common units and conversions
Sep 12	
Sep 14	Dissolved Oxygen
Sep 16	
Sep 19	<b>EXAM 1</b>
Sep 21	Redox Reactions
Sep 23	
Sep 26	
Sep 28	
Sep 30	<b>EXAM 2</b>
Oct 3	Carbon Cycle
Oct 5	
Oct 7	Nitrogen Cycle
Oct 10	
Oct 12	Phosphorus Cycle
Oct 14	
Oct 17	Nutrient Limitations
Oct 19	
Oct 21	Mass balances in aquatic ecosystems
Oct 24	
Oct 26	<b>EXAM 3</b>
Oct 28	Thermodynamics
Oct 31	
Nov 2	Acid/Base Chemistry
Nov 4	
Nov 7	<b>EXAM 4</b>
Nov 9	Acid/Base Chemistry - Models
Nov 11	
Nov 14	
Nov 16	Carbonate Chemistry
Nov 18	
Nov 21	Mixed Models
Nov 23	Complexation & Precipitation/Dissolution
Nov 25	<b>NO CLASS</b>
Nov 28	Complexation & Precipitation/Dissolution
Nov 30	
Dec 2	<b>EXAM 5</b>
Dec 5	Mercury Cycling
Dec 7	
Dec 9	Organic Pollutants
Dec 12	
Dec 14	
<b>Finals Week</b>	
<b>EXAM 6 – Tuesday December 20 from 2:45 pm – 4:45 pm</b>	

**Lab Schedule (tentative)**

	<b>Week of:</b>	<b>Lab Topic</b>
	Sep 5	No Lab
1	Sep 12	Calibrating Hydrolab's and measuring reaeration
2	Sep 19	Collecting samples in the field
3	Sep 26	Filtration and total suspended solids
4	Oct 3	Alkalinity titrations
5	Oct 10	Hardness titrations
6	Oct 17	Standards and calibration curves
7	Oct 24	Colorimetry – Soluble reactive phosphorus analysis
8	Oct 31	Colorimetry – Nitrate analysis & Persulfate Digestion
9	Nov 7	Total phosphorus and total nitrogen analysis
10	Nov 14	Atomic Absorption Spectrophotometry
11	Nov 21	Statistics
12	Nov 28	Watershed Description
	Dec 5	Open lab for technical paper
	Dec 12	No Lab