

# Course Change Request

## New Course Proposal

Date Submitted: 10/01/25 10:01 am

Viewing: **GEOL 658 : Chemical Oceanography**

Last edit: 12/01/25 11:59 am

Changes proposed by: ggilleau

Are you completing this form on someone else's behalf?

### In Workflow

1. **AOES -Curriculum Committee**
2. **AOES Chair**
3. **SC Curriculum Committee**
4. SC Assistant Dean
5. Assoc Provost-Graduate
6. Registrar-Courses
7. Banner

### Approval Path

1. 10/30/25 1:25 pm  
Barry Klinger  
(bklinger):  
Approved for AOES - Curriculum Committee
2. 11/05/25 4:31 pm  
Mark Uhen  
(muhen): Rollback to AOES -Curriculum Committee for AOES Chair
3. 11/25/25 10:06 pm  
Barry Klinger  
(bklinger):  
Approved for AOES - Curriculum Committee
4. 12/01/25 8:46 am  
Mark Uhen  
(muhen): Approved for AOES Chair

No

**Effective Term:** Spring 2026**Subject Code:** GEOL - Geology**Course Number:** 658**Bundled Courses:****Is this course replacing another course?** No**Equivalent Courses:****Catalog Title:** Chemical Oceanography**Banner Title:** Chemical Oceanography**Will section titles  
vary by semester?** No**Credits:** 3**Schedule Type:** Lecture**Hours of Lecture or Seminar per  
week:** 3

**Repeatable:** May be only taken once for credit, limited to 3 attempts (N3) **Max Allowable Credits:** 9

**Default Grade  
Mode:** Graduate Regular**Recommended  
Prerequisite(s):**

A full year of Introductory Chemistry at the undergraduate institution, as well as undergraduate courses in Geochemistry and Oceanography.

**Recommended  
Corequisite(s):****Required  
Prerequisite(s) /  
Corequisite(s)  
(Updates only):****Registrar's Office Use Only - Required Prerequisite(s)/Corequisite(s):**

And/Or	(	Course/Test Code	Min Grade/Score	Academic Level	)	Concurrency?

**Registration  
Restrictions  
(Updates only):**

**Registrar's Office Use Only - Registration Restrictions:**

**Field(s) of Study:**

**Class(es):**

**Level(s):**

**Degree(s):**

**School(s):**

**Catalog**

**Description:**

The world's oceans, including a variety of closed basins and estuaries, comprise a complex and dynamic system of chemical processes that interact with biological, geological, physical, and atmospheric processes to play a significant role in defining the earth's fragile environment. This course will present an overview of the origin, occurrence, and distribution of the chemical components in seawater and an introduction to the basic principles of the chemical processes taking place in the marine environment.

**Justification:**

What: Creating a new course

Why: The course will be useful for the new PhD in Geology and Earth Sciences (GESG), and will help students who are doing work related to marine geochemistry. It will also be a useful elective for the Earth System Science (ESS) degree. Chemistry has declared an intention to make a cross-listed graduate course.

**Does this course cover material which crosses into another department?** Yes

**Impacted  
Departments:**

Department
CHEM - Chemistry & Biochemistry

**Learning Outcomes:**

- Explore the basic elemental composition of seawater and its influence on various oceanic processes
- Decipher key biogeochemical cycles such as carbon, oxygen, and macronutrients in the ocean
- Comprehend how ocean chemistry affects Earth's climate, including CO<sub>2</sub> sequestration and the carbonate chemistry of the oceans
- Explore how geological processes influence marine chemistry, as well as the role of marine chemistry in regulating marine ecosystems

**Will this course be scheduled as a cross-level cross listed section?** No

**Attach Syllabus**

[GEOL 658 Chemical Oceanography.pdf](#)

**Additional  
Attachments****Staffing:**

Prof. Brittany Hupp

**Relationship to  
Existing Programs:**

Will be an important elective for the ESS MS and GESC PhD programs

**Relationship to  
Existing Courses:**

Previously we had an undergraduate course GEOL 458 Chemical Oceanography, but it is being deactivated (see GEOL 458 proposal for reasons).

**Have you reached out to the Libraries to determine whether there are adequate resources to support your course? If not, please email Meg Meiman, Associate University Librarian for Learning, Research, and Engagement at mmeiman2@gmu.edu.**

No

**Additional  
Comments:****Reviewer  
Comments**

Mark Uhen (muhen) (11/05/25 4:31 pm): Rollback: Needs revision

Key: 19092

# GEOL/CHEM 658: CHEMICAL OCEANOGRAPHY

## SPRING 20XX

### COURSE INFORMATION

Instructor: Dr. Brittany Hupp (she/her/hers)

Contact Information: [bhupp@gmu.edu](mailto:bhupp@gmu.edu)

Office Hours: W 2:00 to 3:00 pm or by appointment; Exploratory Hall 3410

Class Hours: Mondays & Wednesdays, 10:30 to 11:45 am

Class Location: Exploratory Hall L1005

### COURSE CATALOGUE DESCRIPTION

The world's oceans, including a variety of closed basins and estuaries, comprise a complex and dynamic system of chemical processes that interact with biological, geological, physical, and atmospheric processes to play a significant role in defining the earth's fragile environment. This course will present an overview of the origin, occurrence, and distribution of the chemical components in seawater and an introduction to the basic principles of the chemical processes taking place in the marine environment. Designated a Green Leaf Course. Offered by Atmospheric/Oceanic/Earth Sci. Limited to three attempts. Equivalent to CHEM 558.

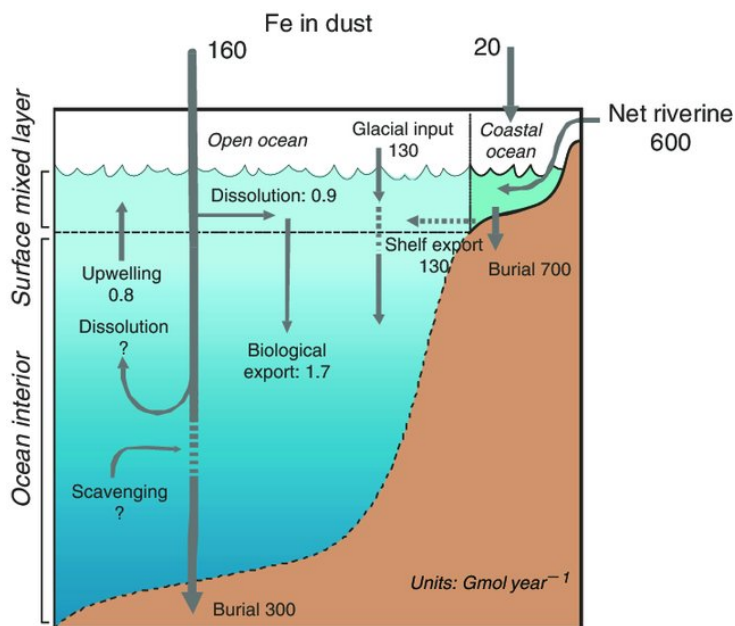
### RECOMMENDED CLASS TEXT\*:

*Introduction to Marine Biogeochemistry*, 2<sup>nd</sup> Edition, Susan Libes, ISBN 10: 9780120885305; ISBN 13: 9780120885305

\*Additional readings will be added to the course website as needed.

### PREREQUISITES

An undergraduate degree in physical or natural sciences, including at least one semester of chemistry, introductory physical geology, and preferably, mineralogy, or permission of instructor.



Hunter and Boyd, 2007

## STUDENT LEARNING OBJECTIVES

Upon successful completion of this course, students will be able to:

1. Summarize controls on the spatial and temporal distribution of key elements and nutrients.
2. Discuss the primary drivers of oxygen and carbon cycling in the modern ocean.
3. Interpret chemical data to infer changes in ocean circulation.
4. Recall the controls on organic matter production, destruction, and preservation.
5. Infer changes in the carbonate system and redox conditions above and below the sediment-water interface.
6. Interpret changes in fluxes associated with global biogeochemical cycles and the box models used to describe them.
7. Predict ways in which marine chemistry responds to and acts as feedback to climate.
8. Analyze and visualize oceanographic data to investigate chemical processes occurring in the modern ocean.
9. Communicate your expertise in an area of chemical oceanography relevant to your research or interests.
10. Critically evaluate published literature in the field of chemical oceanography.

## COURSE STRUCTURE

This course will cover seven major topics:

- Element Distributions in the Oceans
- Ocean Circulation & Tracers
- Air-Sea Gas Exchange & the Biological Pump
- Redox Chemistry, OMZs, and Dead Zones
- Organic Matter Production, Destruction, & Particle Flux
- Carbonate Chemistry & the Marine Carbon Cycle
- Marine Sediment Diagenesis & Authigenesis

Two lectures will be given for each of these topics, followed by a class period devoted to a data dive exercise and a class period devoted to a discussion of scientific literature relating to the topic.

Final grades for this course will be evaluated through four key assignment types:

**1. Discussion Participation, Paper Annotations, and Discussion Questions (40%):** Two scientific papers will be assigned for each paper discussion. Students will be required to highlight key information and annotate each paper prior to each class meeting where those papers will be discussed. Annotated papers are due at the start of each class discussion. Students must also identify two questions they had from their paper reading. These questions are also due at the start of class and will be used to help facilitate each discussion.

**2. Discussion Lead (10%):** Each student will lead a paper discussion twice throughout the course period (5% of your grade for each presentation/discussion lead).

**3. Data Dives (40%):** Students will complete an in-class data-based exercises to explore each of the major topics covered in this course. Correct completion of these assignments and participation in associated in-class discussions account for 40% of the total class grade.

**4. Final Project (10%):** Students will identify a research question that they will investigate using publicly available data from the sources explored during data dive exercises. Students will give a final presentation outlining their research question, hypothesis, investigation, and findings, to be presented during the final exam period.

Assignment Type	%
Discussion Participation, Paper Annotations, & Discussion Questions (n = 7)	40
Discussion Lead (n = 2)	40
Data Dives (n = 7)	10
Final Project	10

### FINAL GRADE SCALE

A+ = 97 – 100%	B+ = 87 – 89%	C+ = 77 – 79%	D = 60 – 69%
A = 93 – 96%	B = 83 – 86%	C = 73 – 76%	F = 0 – 59%
A- = 90 – 92%	B- = 80 – 82%	C- = 70 – 72%	

### COURSE POLICIES

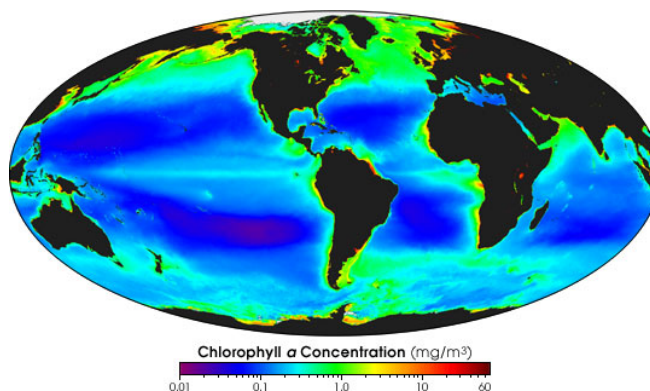
Attendance: Attendance at all scheduled class meetings is required to achieve the requisite level of knowledge in this course.

Expectations for time spent outside of class: Please allot two hours per class meeting outside of class time to work on preparing for paper discussions, completing data dives, and completing the final project.

Technology requirements: Access to a working computer with a strong internet connection is required for data dives started in class. If you have a laptop, please bring it to each class meeting. Microsoft Excel software is required to complete data dives and can be downloaded for free; read more about Excel installation here: <https://its.gmu.edu/service/microsoft365apps/>. You will also need access to a basic scientific calculator.

Use of technology: During class, please be respectful of our time together and do not engage in activities that are unrelated to class. Cell phones may be left on but muted and used for emergencies only.

Names and Pronouns: I will gladly honor your request to address you by your preferred name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes.



Late Policy: All assignments are due at their assigned due dates unless an alternative arrangement has been made. In general, each student is allowed one “freebie” extension of 3 days for one assignment per semester. Beyond the freebie extension, grades earned for work turned in late will be reduced by 25% each set of 3 days it is late (e.g., an assignment turned late will have the grade reduced by 25%, whereas an assignment 3 to 5 days late will have the grade earned reduced by 50%.) If there are circumstances that prevent you from turning in an assignment on time, please contact me before an assignment is late so that we may establish an alternative timeline.

Communication Plan: Email is the best way to get in touch with me. If you send me an email, I will respond within 2 business days. *Please note, I do my best not to read or respond to emails past 6 pm.* I am also reachable in-person before/after class and during office hours. If you would like to meet at an alternative time in person or via zoom, feel free to reach out and we can work together to find a different time to meet.

Policy on Chat GPT or other AI tools: Chat GPT or other AI tools can be used to get started on researching a topic or gathering information used in the assignments for this class. However, you **CANNOT turn in text for any assignment in this class that was written directly by Chat GPT or another AI tool.** Any text handed in written by an AI tool will be given an automatic zero and be reported to the university academic integrity office. Handing in AI-written work is cheating. Also, there is no substitute for reading the papers and building your understanding of the topics through your own reading comprehension. Do not use Chat GPT or another AI tool to summarize the papers for you.

## COURSE SCHEDULE

Week	Tuesday	Thursday
Jan. 20	Lectures: Intro to Class & Constituents of Seawater	
Jan. 27	Lectures: Element Distributions in the Oceans	
Feb. 3	Data Dive 1: Chesapeake Bay	Paper Discussion 1
Feb. 10	Lectures: Ocean Circulation & Tracers	
Feb. 17	Data Dive 2: GEOTRACES	Paper Discussion 2
Feb. 24	Lectures: Air-Sea Gas Exchange & the Biological Pump	
Mar. 3	Data Dive 3: Carbon Isotopes	Paper Discussion 3
Mar 9th-15th: Spring Break		
Mar. 17	Lectures: Redox Chemistry, OMZs, & Dead Zones	
Mar. 24	Data Dive 4: OOI Coastal Array	Paper Discussion 4
Mar. 31	Lectures: Organic Matter Production, Destruction, & Particle Flux	
Apr. 7	Data Dive 5: Sediment Trap Timeseries	Paper Discussion 5
Apr. 14	Lectures: Carbonate Chemistry & the Marine Carbon Cycle	
Apr. 21	Data Dive 6: Sediment Distribution	Paper Discussion 6
Apr. 28	Lectures: Marine Sediment Diagenesis & Authigenesis	
May. 5	Data Dive 7: Porewater Chemistry	Paper Discussion 7
Final Exam Period: Project Presentations		

\*\*\* Note: I reserve the right to make changes to this syllabus as needed.

## MASON POLICY GUIDELINES

These university and class policies are important to understand:

### Academic Standards

Academic Standards exist to promote authentic scholarship, support the institution's goal of maintaining high standards of academic excellence, and encourage continued ethical behavior of faculty and students to cultivate an educational community which values integrity and produces graduates who carry this commitment forward into professional practice.

As members of the George Mason University community, we are committed to fostering an environment of trust, respect, and scholarly excellence. Our academic standards are the foundation of this commitment, guiding our behavior and interactions within this academic community. The practices for implementing these standards adapt to modern practices, disciplinary contexts, and technological advancements. Our standards are embodied in our courses, policies, and scholarship, and are upheld in the following principles:

- **Honesty:** Providing accurate information in all academic endeavors, including communications, assignments, and examinations.
- **Acknowledgement:** Giving proper credit for all contributions to one's work. This involves the use of accurate citations and references for any ideas, words, or materials created by others in the style appropriate to the discipline. It also includes acknowledging shared authorship in group projects, co-authored pieces, and project reports.
- **Uniqueness of Work:** Ensuring that all submitted work is the result of one's own effort and is original, including free from self-plagiarism. This principle extends to written assignments, code, presentations, exams, and all other forms of academic work.

Violations of these standards—including but not limited to plagiarism, fabrication, and cheating—are taken seriously and will be addressed in accordance with university policies. The process for reporting, investigating, and adjudicating violations is [outlined in the university's procedures](#). Consequences of violations may include academic sanctions, disciplinary actions, and other measures necessary to uphold the integrity of our academic community.

The principles outlined in these academic standards reflect our collective commitment to upholding the highest standards of honesty, acknowledgement, and uniqueness of work. By adhering to these principles, we ensure the continued excellence and integrity of George Mason University's academic community.

**Student responsibility:** Students are responsible for understanding how these general expectations regarding academic standards apply to each course, assignment, or exam they participate in; students should ask their instructor for clarification on any aspect that is not clear to them.

### Accommodations for Students with Disabilities

Disability Services at George Mason University is committed to upholding the letter and spirit of the laws that ensure equal treatment of people with disabilities. Under the administration of University Life, Disability Services implements and coordinates reasonable accommodations and disability-related services that afford equal access to university programs and activities. Students can begin the registration process with Disability Services at any time during their enrollment at George Mason University. If you are seeking accommodations, please visit <https://ds.gmu.edu/> for

detailed information about the Disability Services registration process. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email: [ods@gmu.edu](mailto:ods@gmu.edu). Phone: (703) 993-2474.

**Student responsibility:** Students are responsible for registering with Disability Services and communicating about their approved accommodations with their instructor *in advance* of any relevant class meeting, assignment, or exam.

### **FERPA and Use of GMU Email Addresses for Course Communication**

The [Family Educational Rights and Privacy Act \(FERPA\)](#) governs the disclosure of [education records for eligible students](#) and is an essential aspect of any course. **Students must use their GMU email account** to receive important University information, including communications related to this class. Instructors will not respond to messages sent from or send messages regarding course content to a non-GMU email address.

**Student responsibility:** Students are responsible for checking their GMU email regularly for course-related information, and/or ensuring that GMU email messages are forwarded to an account they do check.

### **Title IX Resources and Required Reporting**

As a part of George Mason University's commitment to providing a safe and non-discriminatory learning, living, and working environment for all members of the University community, the University does not discriminate on the basis of sex or gender in any of its education or employment programs and activities. Accordingly, **all non-confidential employees, including your faculty member, have a legal requirement to report to the Title IX Coordinator, all relevant details obtained directly or indirectly about any incident of Prohibited Conduct** (such as sexual harassment, sexual assault, gender-based stalking, dating/domestic violence). Upon notifying the Title IX Coordinator of possible Prohibited Conduct, the Title IX Coordinator will assess the report and determine if outreach is required. If outreach is required, the individual the report is about (the "Complainant") will receive a communication, likely in the form of an email, offering that person the option to meet with a representative of the Title IX office.

For more information about non-confidential employees, resources, and Prohibited Conduct, please see [University Policy 1202: Sexual and Gender-Based Misconduct and Other Forms of Interpersonal Violence](#). Questions regarding Title IX can be directed to the Title IX Coordinator via email to [TitleIX@gmu.edu](mailto:TitleIX@gmu.edu), by phone at 703-993-8730, or in person on the Fairfax campus in Aquia 373.

**Student opportunity:** If you prefer to speak to someone *confidentially*, please contact one of Mason's confidential employees in Student Support and Advocacy ([SSAC](#)), Counseling and Psychological Services ([CAPS](#)), Student Health Services ([SHS](#)), and/or the [Office of the University Ombudsperson](#).