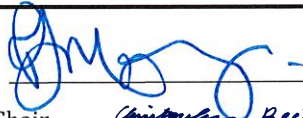

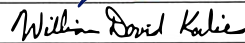


 <b>FLORIDA ATLANTIC UNIVERSITY</b>	<b>NEW COURSE PROPOSAL</b> <b>Graduate Programs</b>		UGPC Approval _____ UFS Approval _____ SCNS Submittal _____
	<b>Department</b> Marine Science and Oceanography <b>College</b> Science <i>(To obtain a course number, contact erudolph@fau.edu)</i>		Confirmed _____ Banner _____ Catalog _____
<b>Prefix</b> OCE <b>Number</b> 6050	<i>(L = Lab Course; C = Combined Lecture/Lab; add if appropriate)</i> <b>Lab Code</b>	<b>Type of Course</b> Lecture	<b>Course Title</b> Chemical Oceanography
<b>Credits</b> <i>(Review Provost Memorandum)</i> <b>3</b>	<b>Grading</b> <i>(Select One Option)</i> Regular X Sat/UnSat	<b>Course Description</b> <i>(Syllabus must be attached; see Guidelines)</i> OCE 6057 explores major chemical processes within the world's oceans, including estuaries, continental margins, and the open ocean.	
<b>Effective Date</b> <i>(TERM &amp; YEAR)</i> Spring 2021	<b>Prerequisites</b> Required: General Chemistry 1 (equal to CHM 2045) Recommended: General Chemistry 2 (equal to CHM 2045); Organic Chemistry 1 (equal to CHM 2210) <i>Prerequisites, Corequisites and Registration Controls are enforced for all sections of course.</i>		
<b>Prerequisites</b> Required: General Chemistry 1 (equal to CHM 2045) Recommended: General Chemistry 2 (equal to CHM 2045); Organic Chemistry 1 (equal to CHM 2210) <i>Prerequisites, Corequisites and Registration Controls are enforced for all sections of course.</i>		<b>Academic Service Learning (ASL) course</b> Academic Service Learning statement must be indicated in syllabus and approval attached to this form.	
<b>Minimum qualifications needed to teach course:</b> Member of the FAU graduate faculty and has a terminal degree in the subject area (or a closely related field.)		<b>Corequisites</b> None	<b>Registration Controls</b> <i>(For example, Major, College, Level)</i> Graduate Standing
<b>Faculty Contact/Email/Phone</b> Jordon S. Beckler/6-2421/jbeckler@fau.edu		<b>List textbook information in syllabus or here</b> Susan M. Libes. 2009. Introduction to Marine Biogeochemistry, Elsevier, Burlington, MA	
<b>Faculty Contact/Email/Phone</b> Jordon S. Beckler/6-2421/jbeckler@fau.edu		<b>List/Attach comments from departments affected by new course</b>	

<b>Approved by</b> Department Chair  College Curriculum Chair  2020.03.06 11:42:49 -05'00' College Dean  UGPC Chair _____ UGC Chair _____ Graduate College Dean _____ UFS President _____ Provost _____	<b>Date</b> 2/24/2020 _____ March 9, 2020 _____ _____ _____ _____
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Email this form and syllabus to [UGPC@fau.edu](mailto:UGPC@fau.edu) 10 days before the UGPC meeting.

## Course Syllabus

### Chemical Oceanography - OCE 6050, 3 credits

**Lectures:** 2021 Spring semester, Mondays, 10 - 12:50 pm.

Instructors:

**Lead Instructor:** Jordon S. Beckler, Ph.D.; Room 202, HB-50 (Lab II),  
Phone: (772) 242-2421      E-mail: [jbeckler@fau.edu](mailto:jbeckler@fau.edu)

Office hours: Mondays, 2:00 PM – 4:00 PM, or by appointment

**TA Contact Information:** None

**Course Location:** MC 209, Johnson Education Center, Harbor Branch Oceanographic Institute at Florida Atlantic University, Fort Pierce; VC to Boca Raton and Davie campuses

#### **Prerequisites:**

**Required:** Graduate standing, General Chemistry 1 (equal to CHM 2045)

**Recommended:** General Chemistry 2 (equal to CHM 2045); Organic Chemistry 1 (equivalent to CHM 2210)

**Course Description:** OCE 6057 explores major chemical processes within the world's oceans, including estuaries, continental margins, and the open ocean.

#### **Course Objectives/Student Learning Outcomes**

This course aims to expose students to major chemical processes within the world's ocean, including estuaries, continental margins, and the open ocean. After completing this course, students should be able to:

- a. Understand important chemical processes occurring in the marine environment and the interactions of these processes with biological and physical processes, e.g. the biological pump.
- b. Explain the underlying principles of biogeochemical cycling in marine systems and develop quantitative models using literature or measured parameters
- c. Understand the natural and anthropogenic environmental factors and processes that control the abundances and distributions of chemical elements, and in turn, marine microbes and plankton.
- d. Understand the basic instrumentation, analytical techniques, and models used by chemical oceanographers.
- e. Appreciate the major problems and new challenges in chemical oceanography, including climate change, warming, ocean acidification, deoxygenation, etc.

- f. Interpret oceanographic observations and intuit cause-and-effect relationships to better understand ocean systems.

## **Recommended Text/Readings**

### **Textbooks:**

Susan M. Libes. 2009. *Introduction to Marine Biogeochemistry*, Elsevier, Burlington, MA

### **Readings:**

Relevant readings will be provided before lectures.

## **Required Software**

Stella Architect (\$60 for student version) will be used for the final project. Students will create a box model of a biogeochemical process, ideally related to their research.

## **Supplementary/recommended Readings**

**Note:** Portions of the following may be ‘recommended’ as deemed fit by the instructors. Otherwise, the student should just consider these as supplementary reading at his/her discretion or need.

Bianchi, T.S. 2007. *Biogeochemistry of Estuaries*, Oxford University Press, New York. 706 pp.

Burdige, D.J. 2006. *Geochemistry of Marine Sediments*, Princeton University Press, New Jersey. 608 pp.

Chester, R. *Marine Geochemistry*, Blackwell/Science Ltd Editorial Offices, Oxford, 506 pp.

Drever, J.I. 1997. *The Geochemistry of Natural Waters: Surface and Groundwater Environments (3<sup>rd</sup> Revised Edition)*, Prentice Hall, NJ.

Millero, F.J. 2013. *Chemical Oceanography*, 4th Edition. CRC Press, Boca Raton, FL.

## **Course Calendar:**

First class: Monday, January 11<sup>th</sup>, 2021

No classes: January 18<sup>th</sup>, March 8<sup>th</sup>

Last class: Monday, April 26<sup>th</sup>

*Tentative Dates of Exams: TBD*

## Course Policies and Procedures

### Course Evaluation Methods

Final grades will be determined by averaging together grades for four activities:

Mid-Term Exam	25%
Final Exam	25%
Homework	20%
Special Topic Presentation	20%
Field Data Participation/Group Presentation	10%

### Course Grading Scale

Percentage Score:	Grade:	Percentage Score:	Grade:
92% - 100%	A	72% - 77%	C
90% - 91%	A-	70% - 71%	C-
88% - 89%	B <sup>+</sup>	68% - 69%	D <sup>+</sup>
82% - 87%	B	62% - 67%	D
80% - 81%	B-	60% - 61%	D-
78% - 79%	C <sup>+</sup>	0% - 59%	F

**Attendance Policy:** Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance. Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family emergencies, military obligation, court-imposed legal obligations or participation in University-approved activities. Examples of University-approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances, debate activities, or research activities condoned by a thesis advisor, with permission from the instructors. It is the student's responsibility to give the instructor notice prior to any anticipated absences and within a reasonable amount of time after an unanticipated absence, ordinarily by the next scheduled class meeting. Instructors must allow each student who is absent for a University-approved reason the opportunity to make up work missed without any reduction in the student's final course grade as a direct result of such absence.

**Religious Accommodations:** Students who wish to be excused from coursework, class activities or examinations **must notify the instructor in advance of their intention to participate** in religious observation and request an excused absence.

**Incomplete Grade:** A grade of Incomplete ("I") is reserved for students who are passing a course but have not completed all the required work because of exceptional circumstances. A grade of "I" will only be given under certain conditions and in accordance with the academic policies and regulations put forward in FAU's University Catalog. The student must show exceptional circumstances why requirements cannot be met. A request for an incomplete grade has to be made in

writing with supporting documentation, where appropriate. As per university policy, an incomplete grade will only be given to a student who fulfills all of the following criteria:

1. Misses multiple exams or the final examination due to a legitimately documented emergency as defined by the FAU Academic Policies and Regulations:  
[http://www.fau.edu/academic/registrar/09-10\\_catalog/academics.html](http://www.fau.edu/academic/registrar/09-10_catalog/academics.html)
2. Has a grade of C or better
3. Submits evidence of the emergency and signs an incomplete agreement.

**Safety:** No food or drinks are permitted in the laboratory (i.e. during the field/lab day).

**Field work:** We will make every effort to participate in a one-day oceanographic cruise (in collaboration with the Biological Oceanography and Physical Oceanography classes), but this ultimately depends on weather. In the adverse scenario in which we do not have the field day, we will instead have an assignment that is dependent on processing an existing dataset furnished by Dr. Beckler.

**Classroom Etiquette Policy:** University policy on the use of electronic devices states: “In order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular telephones and pagers, are to be disabled in class sessions.” You may be asked to leave the class session for noncompliance.

**Code of Academic Integrity Statement:** Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see University Regulation 4.001: [http://www.fau.edu/ctl/4.001 Code of Academic\\_Integrity.pdf](http://www.fau.edu/ctl/4.001_Code_of_Academic_Integrity.pdf)

**Cheating is a serious offense. If you are caught cheating, you will receive an F in the course. In addition, you will be referred to the Dean of Student Services and charged with an academic crime. Test procedures and rules will be stated at the beginning of each exam.**

**Disabilities Policy Statement:** In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) and follow all SAS procedures. SAS has offices across three of FAU’s campuses – Boca Raton, Davie and Jupiter – however disability services are available for students on all campuses. For more information, please visit the SAS website at [www.fau.edu/sas/](http://www.fau.edu/sas/).

**Counseling and Psychological Services (CAPS) Center:** Life as a university student can be challenging physically, mentally and emotionally. Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU’s Counseling and

Psychological Services (CAPS) Center. CAPS provides FAU students a range of services – individual counseling, support meetings, and psychiatric services, to name a few – offered to help improve and maintain emotional well-being. For more information, go to <http://www.fau.edu/counseling/>.

**Important Dates:** The following dates are based upon the current university academic calendar. Changes to these critical dates have occurred in the past and you are responsible for checking the academic calendar on the university website for any changes during the academic term.

*Academic calendar:* <https://www.fau.edu/registrar/pdf/AcademicCalendar2020-2021.pdf>

Last day to withdraw w/o consequences	January 15 <sup>th</sup> , 2021
Martin Luther King Holiday	January 18 <sup>th</sup> , 2021
Last day to withdraw w/o receiving an "F"	March 26 <sup>th</sup> , 2021
Spring Break	March 6 <sup>th</sup> – March 12 <sup>th</sup>

*University Final exam Schedule:*

[https://www.fau.edu/registrar/pdf/Fall\\_2020\\_Final\\_Exam\\_Schedule-Mar\\_27.pdf](https://www.fau.edu/registrar/pdf/Fall_2020_Final_Exam_Schedule-Mar_27.pdf)

### **Course Topical Outline (subject to modification)**

Note: For each lecture, students will be assigned selected readings from texts and/or peer-reviewed publications. PowerPoint presentations of class lectures will also be provided as PDFs.

First class: Monday, January 11<sup>th</sup>, 2021

No classes: January 18<sup>th</sup>, March 8<sup>th</sup>

Last class: Monday, April 26<sup>th</sup>

*Tentative Dates of Exams: TBD*

Jan 11:

- Course overview and introduction (Beckler)
- Crust-Ocean-Atmosphere system
- Water
- Salt/Salinity

Jan 25:

- Seawater, major and minor components
- Chem equilibria
- Complexation, ions, mineral dissolution, acid/base eq.

Sep.14

- Oxidation-reduction reactions and speciation
- Redox; Photosynthesis/Respiration

- Diagenesis

Feb 1:

- Organic biogeochemistry

Feb 8:

- *Midterm exam*
- Cruise planning

Feb 15:

- Interpreting oceanic salinity & nutrient distributions (Ch. 4, 9, 10)
- More detailed N/P cycling (Ch. 24)

Feb 22:

- Silica cycle (Ch. 16)
- Calcite/alkalinity, pH (Ch. 15)

March 1 (*tentative*)

- Field Trip

March 15:

- Sediment distributions (Ch. 13, 14, 17, 18, 19, 20)

March 22:

- Rock cycling (Ch. 21)
- Trace elements (Ch. 11)

March 29:

- Carbon cycling (Ch. 25)
- Petroleum (Ch. 26)

April 5:

- Marine natural products (Ch. 27)
- Marine pollution (Ch. 28)

April 12:

- Field Data presentations

April 19:

- Special Topics presentations

April 26:

- Special Topics presentations

*April 29-May 5*

- *Final Exam TBD*