Global Biogeochemical Cycles
MARS 4810/6810

3:30-4:45, Tuesday/Thursday, Marine Sciences Building Room 247

General Course information:

Overview: Elemental turnover processes are important in modifying the earth's lithosphere, hydrosphere and atmosphere. The objective of this course is to gain working knowledge of global biogeochemical cycles, focusing on the role of the ocean. The class covers both fundamental principles as well as a quantitative analysis, including box models. Contemporary cycling of C, N, P, Si as well as other nutrients will be discussed in both a qualitative and quantitative context, and the interactions between these cycles will be highlighted. Emphasis is on modern day conditions, but glacial-interglacial changes and effects of global change are included. Graduate students will be required to write a research term paper.

> "The biogeochemical cycles of carbon, oxygen, nitrogen, sulphur and phosphorus constitute the life-supporting system for our planet since their dynamics determine the composition of the atmosphere as well as the fertility of land and water. Disturbances in these cycles may have global, regional and local implications which can only be assessed against the background of *integrated, interdisciplinary knowledge* of the **budgets** and the **flows** of the cycle components and of the **mechanisms** mediating their **conversions** and **transport**".
> V. Kovda and J.W.M. la Riviere. co-chairmen SCOPE (Scientific Committee on Problems of the Environment) project on Biogeochemical Cycles. SCOPE 7, 1976 (my emphases)

Lecture outline

Date		Topic
Tues	Jan 8	**Introduction & Overview**
Thu	Jan 10	**Origins**
Tues	Jan 15	**Chemistry fundamentals: Thermodynamics and Isotopes**
		HANDOUT HOMEWORK 1
Thu	Jan 17	**Chemistry fundamentals: Redox, kinetics and organic matter**
Tues	Jan 22	**Budgets: Ocean composition, Salt content**
Thu	Jan 24	**Box models & System approach: Transport, conservation equations**
Thu	Jan 29	**Earth system compartments: atmosphere and lithosphere**
Tues	Jan 31	**Earth system compartments: Hydrosphere and biosphere**
Thu	Feb 5	**Ocean transport: circulation, tracers**
Tues	Feb 7	**The pumps: biological, solubility**
Tues	Feb 12	**Inputs: Rivers, weathering**
Thu	Feb 14	**Inputs**: **Vents**
Tues	Feb 19	**Marine OM cycling: production, export and mineralization**
Thu	Feb 21	**Terrestrial key components**
Tues	*Feb 26*	*Midterm*
Thu	Feb 28	**Global cycles: Si**
Tues	Mar 4	**Global cycles: C**
	Mar 4	*Midpoint Withdrawal Deadline*
Thu	Mar 6	**Global cycles: C and $CaCO_3$**
Tues/Thu	Mar 11/13	Spring BREAK
Tues	Mar 18	**Global cycles: P, N**
Thu	Mar 20	**Global cycles: S**
Tues	Mar 25	**Global cycles: Fe, O_2**

Thu	Mar 27	**Global cycles: coupling of bgc cycles**
Tues	Apr 1	**Global cycles: trace metals**
Thu	Apr 3	**Glacial-interglacial patterns: P, pCO2**
Tues	Apr 8	**Glacial-interglacial patterns: sea ice, biota**
Thu	Apr 10	**Global Change: Climate and C cycle**
Tues	Apr 15	**Global Change: Ocean acidification**
Thu	Apr 17	**Gatekeepers/Interfaces: coastal ocean**
Tues	Apr 22	**Termpaper presentation**
Thu	Apr 24	**Termpaper presentation**
Thu	*May 1 (3.30pm-6.30pm) Final exam*	

Grade Distribution:

Grades will result from your performance on homework, exams and written (term paper) assignments.

Assignment	Points
Homework #1	50
Homework #2	50
Homework #3	50
Homework #4	50
Mid-Term Exam	125
Final Exam	125
Graduate Students (6810): Term Paper	150

Homework: Homework (except if designated differently in the case of in-class paper discussions) is due at the beginning of class. If your homework is late (i.e., if you turn it in after the beginning of class), 5% will be deducted from your overall grade. An additional 5% will be deducted for each day the assignment is late.

Exams: There are two exams, a mid-term and a final. Both are 'closed book and in class'

Term Papers: Term papers will describe and model a biogeochemical cycle. Your term paper topic must be approved by **Feb 12**. You can turn in a rough draft of your term paper, which will be evaluated and returned to you within a week. Doing this is optional but it can significantly alter (improve) your grade on your term paper. Term papers are due on **24 April 2008** at the beginning of class. Details regarding the formatting of the Term Papers will be made available in class or on WebCT (http://webct.uga.edu)

Instructor: Dr. Christof Meile
Marine Science Building Room 110G
Telephone: 542-6549
E-mail: cmeile@uga.edu
Office Hours: by appointment

Textbook: None. Reading in form of papers will be provided via WebCT or handed out in class
Two main texts related to the course contents are
1) Ocean Biogeochemical Dynamics by Sarmiento & Gruber
ISBN13: 978-0-691-01707-5
2) Biogeochemistry. An analysis of Global Change by Schlesinger.
Second edition, ISBN-13: 978-0126251555

Attendance: Achieving the goals of this class involves discussing course material, which can only take place in a classroom setting with active participation. For this reason, **attendance is required**. **The only excused absence is for fieldwork**. You need to provide documentation from your Advisor for this at least a week in advance. Holidays celebrated by religions or other groups are only a holiday if UGA is closed. Attendance and participation will be used for rounding, and 6+ absences will results in a W or WF. Excused absence due to sickness requires a written doctor's excuse within a week of absence unless it can be documented that the health condition did not allow meeting this deadline.

Grading Policy: Grades will be assigned using the following grading scheme (in accordance with UGA's new +/- grading policy):

100 - 93 1/3	percent -	A	(4.0)
93 1/3 - 90	percent -	A-	(3.7)
90 - 86 2/3	percent -	B+	(3.3)
86 2/3 - 83 1/3	percent -	B	(3.0)
83 1/3 - 80	percent -	B-	(2.7)
80 - 76 2/3	percent -	C+	(2.3)
76 2/3 - 73 1/3	percent -	C	(2.0)
73 1/3 - 70	percent -	C-	(1.7)
70 - 60	percent -	D	(1.0)
< 60	percent -	F	(0.0)

For more on plus/minus grading see:
http://www.bulletin.uga.edu/PlusMinusGradingFAQ.html#Q12
Because extra-credit options are available [attendance and optional Rough Draft], we do not round up. We also do not give borderline students additional points (the ranges below are firm).

All academic work must meet the standards contained in "A Culture of Honesty." Students are responsible for informing themselves about those standards before

performing any academic work. The link to more detailed information about academic honesty can be found at:
http://www.uga.edu/ovpi/honesty/acadhon.htm

In particular, any form of plagiarism ("to take ideas, writings, etc. from another and pass them off as one's own", Webster's New World Dictionary) **will not be tolerated and result in a failing grade.** There are several forms of plagiarism, ranging from outsourcing your work to somebody else, to slight rewording of a published text or summarizing a text without citing it. If in doubt it is the student's responsibility to consult with the instructor *before* handing something in. Students are allowed to discuss homework in general terms but are required to hand in unique and individual solutions.

The course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary.