



IB 159: The Living Planet: Impact of the Biosphere on the Earth System  
(3 units)  
Course Summary and Syllabus  
Fall Semester, 2019

**Basic information**

Instructor:

Ivo Duijnstee

Instructor e-mail:

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(Please include IB159 in subject line)

Instructor office hours:

Thursdays 11am-12pm in the LooyLab  
(4101 VLSB; 20 ft from the elevators)

## Course description

### *Prerequisites*

Biology 1B or consent of instructor.

### *Overview of the course*

Planet Earth is a complex, dynamic system in which the interplay between its components atmosphere, hydrosphere/cryosphere and lithosphere largely determines the conditions on the planet's outside that we inhabit. The different components exchange matter and energy through global element cycles, volcanism, weathering, evaporation, precipitation, radiation, absorption, etc.; thus continuously changing each other's properties. Also within the components energy and matter are perpetually cycled. Obviously, the changing physicochemical conditions of the abiotic environment have a profound impact on life on earth. Less generally known is what vast influence life continuously asserts on the abiotic components of the earth system; in fact the biosphere itself is an important Earth system component. Interestingly, life – with its evolving species – forms a complex adaptive system. Therefore, with the addition of an adaptive, evolving component, some argue the earth system itself may have gained adaptive properties. We will discuss pros and cons of such Gaia-like views.

During our course we will briefly touch on General Systems Theory and Cybernetics. However, the focus will be on the ever-changing state of System Earth (especially in terms of global climate) throughout our planet's geologic history; in particular the effect the evolving biosphere has had on the Earth system over the last 3.5 billion years, and vice versa. We will cover a wide range of temporal and spatial scales (from sub-decadal to hundreds of millions of years, and from regional to global and beyond), and discover that variations in the Earth's state are governed by different sets of processes on different spatial and temporal scales. In the last part of the course we will focus on what some consider the recent emergence of yet another component in the earth system: the anthroposphere. In the current age of human-induced climate change we cannot neglect to explore as to what extent one particular species of bipedal mammal may affect the earth system.

### *Course format*

Two hours of lecture and two-hour discussion sections (or assignments) per week.

### *Primary text: Required*

The Earth System, Third Edition (2010),  
by Kump, Kastning & Crane; Prentice Hall/Pearson.  
ISBN10: 0321597796  
ISBN13: 9780321597793

## Exams

There will be two exams, one midterm and one final. These are closed book exams, with short-answer, as well as multiple-choice questions. The exam will be based on the things you learned during lecture and the material covered during the discussions. Although the exams are not cumulative, a good understanding of the foundational concepts covered during the first part of this course will still be important for the second part.

Time and location of the *midterm*: Monday, October 21, 2019 in 3003 VLSB, 2-4pm

Time and location of the *final*: Thursday, December 19, 2019 from 3 to 6pm. The location of the final exam has yet to be determined.

## Policies

### *Grading break-down*

Midterm (material from Part I)	35%
Final (material from Part II)	40%
Class participation (incl. audience feed-back)	5%
<u>Sections (participation, quizzes, etc.)</u>	<u>20%</u>
	100%

### *Grades*

The class can be taken for a grade and as pass/no pass. A **C-** or higher is required to pass this class. See also: <https://registrar.berkeley.edu/academic-records/grades> The grades will NOT be curved. Written grade appeals are accepted in a time window starting three days after the initial grade has been assigned until ten days after. Before or after this period appeals will not be considered. Students who wish to review their exam should email the instructor. Be aware that re-grades can result in point deductions as well.

### *Attendance and class participation*

Attendance is recommended for lectures and **required** for discussion sections. Part of your course grade will be based on your participation during section. However, obviously, if you have a legitimate reason for being late or missing a section entirely, like a family emergency or illness, please contact your GSI as soon as possible. Generally, we will require written proof of the situation. Of course, non-emergency, non-pre-approved absence in sections will likely result in the point deduction.

Please attend the section that you actually signed up for, but if you need to change to the other section, please coordinate with your GSI.

### *Classroom etiquette*

Being prepared, attentive listening and completion of in-class work is important. Perhaps needless to say: be courteous and be on time, and most importantly: respect your fellow students and their opinions. We would like everyone to feel comfortable in our class. Please, no class-irrelevant laptop, tablet or cell phone use during class (points may be deducted for class participation).

### *Missed exams and missed or late assignments*

You are expected to take all exams at their scheduled date and time. How we deal with missed exams and missed or late assignment will be decided on an individual basis by the instructor. If you know you are going to miss an exam, contact the instructor well in advance. When you have missed an exam or assignment it is **up to you** to contact the instructor about this. We are always happy to help with scheduling conflicts and legitimate absence cases, but failure to bring it up can have consequences for your grade.

### *Reporting illness and family emergencies*

If illness or a family emergency does prevent you from making an exam, generally we will require written proof of the situation. Don't forget: we are always happy to help if we can, so please talk to us so we can take your hardship into account, or provide simple accommodations to mitigate the situation.

### *Extra credit opportunities*

Besides potential bonus questions on exams, no extra credit opportunities are offered for this class.

### *Permissible and impermissible collaboration & academic honesty*

As you know students will be expected to produce their own work product and utilize appropriate references when required. If you are unsure or uncomfortable about your skills in this area, please contact the Student Learning Center for some assistance. Of course we assume this is will not apply to you, but for completeness we would like to state here that academic honesty violations are grounds for an F in this course, and that it will have to be reported to the Center for Student Conduct.

## Discussion and Lab Components

### *Assignments*

Your assignment and duties vary per discussion section, on which you will be briefed by your GSI. In summary, this is what you will be doing during sections this semester:

- Make 9 short quizzes – mandatory and (almost) weekly
- Create and review a glossary entry every other week
- Participate in the lab exercises
- Give one presentation in the 2nd half of the semester (details later in the semester)

### *Short quiz*

During section a total of 9 quizzes will be given. These are merely meant to make sure you are on top of your reading assignments. These very short quizzes will cover the readings that are assigned for the two lectures that took place the Monday before the discussion section (or in one instance also from the week before – see 'Schedule' below).

### *Glossary assignment*

- Every two weeks each student creates a new glossary entry that synthetically explain a topic for the course (limit to 280 characters)
- This glossary will be shared with all students in the class
- Students will be randomly assigned a glossary entry to review

### *Lab exercises*

We will supply you with the lab exercises at the beginning of the section. Your work in these exercises will be part of the discussion section grade.

## Schedule

### *Calendar of topics and readings*

For a READING SCHEDULE from *Kump et al.*'s "THE EARTH SYSTEM, 3<sup>rd</sup> edition", please see the table on the next page. In our textbook, there is more emphasis on the abiotic than the biotic aspects of the Earth System; both now and in the geologic past. We will use it to provide the earth science backbone for our lectures and discussion sections, on top of which we will add the biotic perspectives. (Additional readings that may be used in the discussion sections and will be provided)

I. INTRODUCTION & THE EARTH SYSTEM COMPONENTS		READING [quiz in discussion nr.]	
09-02	LABOR DAY		
09-09	L1 <i>Feedbacks &amp; Forcings</i> L2 <i>Mother Earth</i>	CH2 p21-33 CH1 p18-19	[D1] [D1]
09-16	L3 <i>Here comes the Sun</i> L4 <i>Air</i>	CH3 p36-55 CH4 p57-70, CH10 p197-199	[D2] [D2]
09-23	L5 <i>Water</i> L6 <i>Ice</i>	CH5 p84-91, p96-106 CH6 p108-120	[D3] [D3]
09-30	L7 <i>Rock</i> L8 <i>Life</i>	CH7 p122-144 CH10 p199-208, if necessary: CH9 p176-188, CH13 p255-269	[D4] [D4]
II. COMPONENT INTERACTIONS, GLOBAL CYCLES AND THEIR IMPACT ON LIFE			
10-07	L9 <i>Recycling Earth's exterior</i> L10 <i>Recycling of the elements I</i>	CH7 p144-146 CH4 p70-82, CH8 p170-173	[D5] [D5]
10-14	L11 <i>Recycling of the elements II</i> L12 <i>Recycling of the elements III</i>	CH8 p149-162 CH8 p162-169	[D5] [D5]
10-21	<b>MIDTERM</b>		
III. IMPACT OF LIFE ON THE EARTH SYSTEM & VICE VERSA: EXAMPLES			
10-22/23 (Tu/We!)	L13 <i>Biogenic heating &amp; cooling</i> L14 <i>Snowball Earth</i>	CH11 p210-224, CH12 p233-239 CH12 p240-252	[D6] [D6]
10-28	<b>CAMPUS CLOSED due to fire-avoiding power outages</b>		
11-04	L15 <i>Conquering continents</i> L16 <i>Mother of all mass extinctions</i>	CH8 p158, p169 (A CLOSER LOOK), CH11 p224-231 CH13 p258-268	[D6] [D6]
11-18	L17 <i>Cenozoic cooling &amp; ice ages</i> L18 <i>Small-scale climate variations</i>	CH14 p272-293 CH5 p92-96, CH15 p295-301	[D7] [D7]
IV. THE NEW EARTH SYSTEM COMPONENT: THE ANTHROSPHERE			
11-25	L19 <i>Dawn of the Anthroposphere</i> L20 <i>Human footprint</i>	CH18 p361-376 browse CH17	[D8] [D8]
12-02	L21/22 <i>Human-made climate/Public debate</i>	CH15 p300-318, CH16 p321-338	[D9]
12-09	L23/24 <i>Our problem. our solutions/The future &amp; wrap-up</i>	CH19 p379-381	
12-19	<b>FINAL EXAM</b> (3-6pm)		

### *Last day to withdraw from the course*

FINAL Add/Drop Deadline: Wednesday, September 18, 2019 (The last day to add and/or drop). For details, see:

[https://registrar.berkeley.edu/sites/default/files/pdf/UCB\\_StudentEnrollmentCalendar\\_2019-20\\_V3.pdf](https://registrar.berkeley.edu/sites/default/files/pdf/UCB_StudentEnrollmentCalendar_2019-20_V3.pdf)

## **Statement on accommodation**

Students who require accommodation for medical, religious or other reasons should contact the instructor before the start of the lecture series. We will be happy to accommodate students with disabilities. We do however require a letter from the Disabled Students' Program.

We would like everyone to get the most out of this course. If there is anything that prevents you from doing well in this class, please come and talk to us, so we can find out if there is something we can do to help.

## **Disclaimer**

This syllabus may be subject to change. Please, check *bCourses* regularly for updates

This syllabus is your handbook for the course. You are responsible for knowing and understanding all the information in it. Not knowing the requirements does not excuse you from fulfilling them.