CAMOSUN COLLEGE	**School of Arts & Science** **CHEMISTRY AND GEOSCIENCE DEPARTMENT** **GEOS 110-001** **Earth-Ocean-Atmosphere System** **Fall 2017**

COURSE OUTLINE

The course description will be online @ http://camosun.ca/learn/calendar/current/web/geos.html

Ω *Please note: the College electronically stores this outline for five (5) years only. It is **strongly recommended** you keep a copy of this outline with your academic records. You will need this outline for any future application/s for transfer credit/s to other colleges/universities.*

1. Instructor Information

(a)	Instructor:	Dr. Tark Hamilton Lecture/Lab/Field Trips		
(b)	Office Hours:	9:30-10:00 T-W-F, 10-11:20 F, 11:30-12:20 T-W-Th or by Appointment		
(c)	Location:	Young 200		
(d)	Phone:	250-370-3331	Alternative Phone:	
(e)	Email:	thamilton@camosun.bc.ca read: Monday through Friday AM		
(f)	Website:	https://sites.camosun.ca/tarkhamilton/ (under construction)		

2. Intended Learning Outcomes

(No changes are to be made to these Intended Learning Outcomes as approved by the Education Council of Camosun College.)

Upon completion of this course the student will be able to:

1. Describe and interpret short-term and long-term Geologic, Oceanic and Atmospheric processes and their interactions.
2. Make hypothesis-based scientific observations, analyze and interpret quantitative data with reference to Geologic, Oceanic and Atmospheric processes.
3. Comment on orbital motion and wave motion and apply standard equations to compute wave velocity.
4. Use simple laboratory equipment to study and measure wave velocity.
5. Utilize standard tide and current tables and software.
6. Interpret relationships among temperature, salinity and density of seawater, and how these properties vary over time.
7. Describe ocean current transport and be able to assess the role of currents in global heat transfer.
8. Describe relationships among surface ocean currents and atmospheric circulation.
9. Analyze grain size of sediment samples and interpret current environment and sedimentary environment of deposition from sediment data.
10. Determine salinity of water samples and the relationship of salinity to temperature, density and dissolved gases.
11. Comment on the energy budget of the atmosphere, and its short-term and long-term variability.
12. Comment on the chemical evolution of the atmosphere.
13. Describe coastal processes at the land-sea interface.
14. Relate ocean-floor topography and ocean depth data to processes of sea-floor spreading and the age of ocean basins.

3. Required Materials

(a) Texts: **The Earth System**, 3rd Ed., **Kump, Lee R., Kasting, James F. and Crane, Robert G.**, Prentice Hall, ISBN-10: 0321597796 • ISBN-13: 9780321597793, ©2010 • Prentice Hall • Paper, 432 pp, Pearsoned.

(b) Other: Calculator, Computer with spread sheet program

(c) http://earthobservatory.nasa.gov/IOTD Weekly additions and archives of space station or satellite digital images of geological events and features around the globe. I put up specific links on the course website and there is lots of archival and searchable material for past geological events: volcanic eruptions, hurricanes, landslides, glaciers, etc.

(d) Recommended short visual text on Climate Change Science for everyone (not just scientists).

Dire Predictions: Understanding Climate Change Science (The Visual Guide to the Findings of the IPCC) Mann, Michael E., and Kump, Lee R., 2nd edition, DK and Prentice Hall, ISBN-10: 0133909778 • ISBN-13: 9780133909777, ©2016 • Prentice Hall • Paper, 208 pp.

(e) background reading on Plate Tectonics, Seafloor Spreading, Ocean Basins, Mountain building, Geological Time and Evolution/Fossil Record in any Physical or Historical Geology Text. There are some in the library and 3 titles are listed below.

Earth: An Introduction to Physical Geology, E.J. Tarbuck, F.K. Lutgens, C.J. Tsujita & S. R. Hickock 4th Canadian ed. Prentice Hall 2014.

on line text: **Physical Geology**, Steven Earle, Thompson River's University, BC Campus Open Ed. September 3, 2015. Link http://open.bccampus.ca/find-open-textbooks/?uuid=52166cd1-e380-4e1b-9a6f-d891936e4749

Wolfson, Richard 2018. **Energy, Climate and Environment 3rd edition**, Norton, New York, 445p plus appendices

4. Course Content and Schedule

Lectures: (2) 1 hour and 20 minute blocks: Tues E344 & Thurs F210 10:00-11:30 F210
Labs: F300 Wed 2:30-5:20 (Lab forms are generally handed out in Thursday lecture) (No lab week of Sept.7, Introductory local Field trip instead, read Ch 1 & 3 in Kump instead for lecture and introductory lab on heat in lab period week 2)

The list that follows represents the intended sequence of topics, but the sequence may be altered in order to discuss events of local or international significance, e.g. rainfall, hurricanes, flooding, landslides, earthquakes, volcanic eruptions, tsunami, as they occur during the course. The relationship of recent and current events to course topics is central to applying course content.

Course Topics and Significant Events: field trips, tests, paper deadlines:

1. Every week there will either be a laboratory exercise, a field trip or a test in lab period. Labs complement the theory portion of the course and teach fundamental concepts and science that form the backbone of the Earth System processes and interactions. There is no lab manual to purchase but there will be weekly lab handouts to fill out your data and draw conclusions.

2. Introduction, KKC Ch. 1, p. 1 – 20
   Introduction to observing earth systems, their components and interactions.

   Local Field trip Sept. 6 in 1st lab period 2:30-5:20. Questionnaire and field notes due in beginning of Lab 2 Sept 13

3. Systems concepts, KKC Ch. 2, p. 21 – 26
4. Feedback and equilibrium, KKC Ch. 2, p. 26 - 35
5. Electromagnetic radiation and Earth's energy balance, KKC Ch. 3, p. 36 – 56

Term Project topic: book a discussion time with Tark about your topic prior to week 3-Friday Sept 25.

(Projects need to present and explain a system or a process, **not** just a single topic on the Atmosphere, Biology, Climate, Cryosphere/Glaciers, Geology, Geochemistry, Oceanography, Weather, or Geology, but **how one of these affects one or more of the others**. See examples of prior paper topics on my website under your course page.)

6. Atmospheric Circulation, KKC Ch. 4, p. 57-83
7. Ocean Circulation, surface currents KKC Ch. 5, p. 84 – 95
   Ocean Circulation, circulation of the deep oceans, p. 96-106

Test 1 ~week 5-Wednesday October 4th in lab period. Chapters 1-4

8. Structure of the solid earth, KKC Ch. 7, p. 122 – 130
   Plate Tectonics, KKC Ch. 7, p. 130 – 147
9. Cryosphere, KKC Ch. 6, p. 108-121
10. Biogeochemical Cycles: The short-term carbon cycle KKC Ch. 8, p. 149 – 159;
    Long-term carbon cycle, KKC Ch. 8, p.
    Carbonate-silicate cycle, p.168-170
    P and N cycles, p. 170-173

Term Project Written Report due in week 10 on Tuesday, Nov. 14 after Remembrance Day Holiday Long Weekend.

11. Origin of the Earth, KKC Ch. 10, p. 190-197
12. Long-term Climate, KKC Ch. 12, p. 233-253

Test 2~week 11-Wednesday Nov. 22 (Ch5, 6, 7)

13. Pleistocene Glaciation; Milankovitch Cycles KKC Ch. 11, p. 271-294
14. Global Warming, Part 1, Recent and Future Climate, KKC Ch. 15, p.295-320.
15. Part 2, Impacts (Massive Extinction Events), Adaptation and Mitigation, p. 321-339.
16. Ozone, KKC Ch. 17, p. 340-360, The Future; & Review

There are 14 broad lecture topics, which will each require about 1 week. We will attempt to cover all the topics thoroughly, as time permits. Bear in mind that the interrelationships amongst topics are of fundamental importance. For example, greenhouse gases affect climate and climate affects the carbon cycle or tectonic mountain building and ocean basin development affect circulation in the atmosphere and oceans. The positions of continents and oceans affects habitat distribution and evolution. The positions of the Sun, Moon and large planets affect the shape of Earth's axial tilt, orbital shape and the precession of the equinoxes and how much solar energy is available.

Use the introductory chapter and a preview of the topics in the rest of the text to choose your personal project report topics. Book a time to discuss them with me and receive direction and approval prior to Friday Sept 25.

5. Basis of Student Assessment (Weighting)

(a) Labs: 10 labs, each worth 2.5% of the course for a total of 25%. Labs are done in pairs for help with measurements discussion of concepts and interpretations. This includes field trips. They support important concepts such as latent heat, convection, relative humidity, geological materials and environmental records, but do not necessarily occur in the same sequence as the lectures. Label each lab assignment with your name and your partner's name. Most people learn most in the lab and pull up their course marks by handing in all of the labs. Lab marks are based on cumulative points earned so a partially complete labs is better than none at all. Labs are due in at the beginning of the following lab period and as such we will be working on new material so there is not time to finish up last week's work. Labs handed in after I return them to the class will not be marked or accepted. **YOU MUST PASS THE LAB TO PASS THE COURSE.**

(b) You must sign a waiver to attend Field Trips. These may occur during lab periods so do not arrive late or we may have gone off without you! 2 half day weekend **Field Trips** are scheduled for ***SaturdaySept 19 8:00 AM to 2:30 PM to Botanical Beach returning via Sooke and Sunday Dec.6, 12:30 PM-6M-Sidney: Armstrong Point-Roberts Bay & Island View Beach.***

(c) Quizzes may occur in Monday class to test assigned readings for week to come and concepts from prior week's lectures. These are marked as "attendance" but helpful for question styles and exam previews.

(d) Exams: Tests 1 in week 5 during lab period, and test 2 in week 11, each worth 15%; Final worth 30%. **YOU MUST PASS THE FINALTO PASS THE COURSE.** I have a 1 test forgiveness policy for those who improve their test scores. For example, if you do better on the final exam than a prior exam, I will replace the preceding lower mark and its proportion with the mark from your final exam.

(e) Term Project on an Earth System topic: (15%) such as (1) an independent earth system science topic involving 2 or more processes and interactions between them, (2) critique a published research paper in a peer reviewed geological or geophysical journal, or conduct your own original field experiment or field based observations relating 2 or more course system components (atmosphere, biosphere, geosphere and hydrosphere and report (or other approved activity)) worth 15%. For example:

i) Are Massive Extinction Events caused by natural geological catastrophes or loss of biodiversity: evidence from the geological record?

ii) Critique of: "Coral Reefs and Ocean Acidification" by Joan A. Kleypas and Kimberly K. Yates (2009) Oceanography Vol. 22, No.4. 108-117. Special issue feature coral reefs and ocean acidification.

iii) Coarsening of beach sediment by longshore drift, down current from the recently stabilized cliffs West of "Sunova Beach", Victoria, B.C.

iv) Local, Regional and Global Effects of continued Tar Sands Mining and Heavy Oil Extraction and Diluted Bitumen Pipelines.

Final exam at the end of the course will cover **all** course & lab material.
You must have a passing grade in the lab portion of the course to be able to write the final exam.
I have a 1 test forgiveness policy for those who improve their test scores. For example, if you do better on the final exam than a prior exam I will replace the lower mark and its proportion with the mark from your final exam.
Don't make travel arrangements for the final exam period Weeks of Dec 11 and 21 until the registrar schedules exams on Camlink October 16th. Only medical excuses will be allowed for missed finals.

6. Grading System

(No changes are to be made to this section unless the Approved Course Description has been forwarded through the Education Council of Camosun College for approval.)

Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
90-100	A+		9
85-89	A		8
80-84	A-		7
77-79	B+		6
73-76	B		5
70-72	B-		4
65-69	C+		3
60-64	C		2
50-59	D	Minimum level of achievement for which credit is granted; a course with a "D" grade cannot be used as a prerequisite.	1
0-49	F	Minimum level has not been achieved.	0

Temporary Grades

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy E-1.5 at **camosun.ca** for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	*Incomplete*: A temporary grade assigned when the requirements of a course have not yet been completed due to hardship or extenuating circumstances, such as illness or death in the family.
IP	*In progress*: A temporary grade assigned for courses that, due to design may require a further enrollment in the same course. No more than two IP grades will be assigned for the same course. *(For these courses a final grade will be assigned to either the 3rd course attempt or at the point of course completion.)*
CW	*Compulsory Withdrawal:* A temporary grade assigned by a Dean when an instructor, after documenting the prescriptive strategies applied and consulting with peers, deems that a student is unsafe to self or others and must be removed from the lab, practicum, worksite, or field placement.

7. Recommended Materials or Services to Assist Students to Succeed Throughout the Course

LEARNING SUPPORT AND SERVICES FOR STUDENTS

There are a variety of services available for students to assist them throughout their learning. This information is available in the College calendar, at Student Services, or the College web site at camosun.ca.

STUDENT CONDUCT POLICY

There is a Student Conduct Policy **which includes plagiarism**.
It is the student's responsibility to become familiar with the content of this policy.
The policy is available in each School Administration Office, at Student Services,
and the College web site in the Policy Section.