Advanced Environmental Chemistry CHEM. 5417.001/101 (4 sem hrs)
Time: TR 11H00-12H15 Room: CI-126 (lecture) R 12H30 – 15H00 CS-214 (lab)
Prerequisite: CHEM 3411

SYLLABUS

Name of instructor: Dr. Yves Coeckelenbergh
Course title: Environmental Chemistry
Course number: 4443.001
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Office: 211 Center for Science
Office hours: T 12H30 to 17H00

Course Description:
This course examines the fate and transport of chemicals in water, air and soil and their impact on the physical and biological world.
Environmental chemistry is an applied field of chemistry. Emphasis will be placed on chemical processes in the environment, chemical cycles, and global issues of environmental concern. Emerging issues of chemistry in the environment, literature searches and seminar presentations are included in the course.

The laboratory portion of the course will contain problem solving exercises, dry labs, some traditional laboratory experiments and the completion of a specific environmental study leading to a report and a class presentation.

Student Learning Outcomes (SLO’s):

Identify the components of the spheres constituting the environment
Describe the relationships between the different spheres
Describe the elemental cycles of matter
Describe Green Chemistry with examples
Describe the hydrological cycle and identify species of water (major, minor, trace)
Perform calculation relating to the carbonate-bicarbonate-CO₂ buffering equilibria
Perform alkalinity calculations
Perform calculations involving pH, pE and pEo
Describe chelating agents, sediments, colloids and solubility
Perform solubility calculations
Describe chemical calculations involving microorganisms
Identify water pollutants and discuss their effects
Describe water treatment processes

Describe the components and physical characteristics of the atmosphere
Describe meteorological and photochemical processes
Identify sources, reactions and fate of O₂, N₂, CO, SO₂, NO₂, NH₃ and sulfides
Identify and describe fate of biogenic organic compounds
Identify and describe the source of atmospheric pollutants
Identify hazardous pollutants
Describe the formation and effects of photochemical smog
Describe particle formation and control
Describe acid rain and ozone depletion
Explain the concept of climate change and global warming

Describe the components and physical characteristics of the geosphere
Describe the physical and chemical processes in geochemistry
Describe the interactions between the geosphere and the other spheres
Describe and perform calculations pertinent to soil and nutrients
Identify and describe pollutants of the geosphere
Identify and describe sources of energy

Describe the transport, fate, treatment and minimization of hazardous waste

Describe toxicity, scales, effect, sensitivity and phases
Identify toxic substance, their exposure routes and their effects
Describe health risk assessment, analysis and detection.

A report will be prepared to discuss the interdisciplinary components of a major environment chemistry topic. The report will be presented in a seminar.

**Graded activities:**

Final grade will be calculated as follows:

Partial exams (3): 300 points (100 points each)
Special report 200 points
Laboratory and quizzes 100 points

Final letter grading for the course will be as follows:
A> 90%, B>80%, C>70%, D>60 %, F < 60%.

A comprehensive final exam is optional. If students choose to take the final exam it will be graded on 150 points and the grade will be included in the final grade calculation even if it reduces the average.
Missed exams without a valid excuse will be graded zero. Most of the questions will consist in problems similar to those seen in class or homework assignments. There will be a few conceptual questions.

Students must be seated no later than 5 min before the start of the exam. There should be as much distance between each student as the classroom configuration allows and the desk must be empty with the exception of a pencil or pen and an optional calculator.

Students are not allowed in the classroom after the start of the exam without the permission of the instructor. In any case no student will be admitted after the first exam-taker has left. Student leaving the room will not be allowed to return unless authorized by the instructor. All material including intermediate calculations will be given to the instructor at the end of the exam. A picture ID is required.

There are no make-up exams. All excuses must be requested in advance with the obvious exception of emergencies. Students with a university approved scheduled absence (athletics, military duty, etc.) should contact the instructor well in advance of the scheduled absence to request an exception. Exams may be taken early in those specific cases. Students who do not arrange to take exams ahead of time will not be eligible for this special consideration. A written excuse from the university department involved or the Office of the Dean of Students may be requested.

**Homework and Quizzes:**

Homework assignments will be posted on Blackboard. There might be additional reading assignments such as literature search.

There will be graded quizzes.

Without a valid excuse homework and quizzes that are not turned in will be graded zero.

**Policies and guidelines:**

This is a classroom course. Textbooks are useful complement but cannot replace attendance to the lecture. **Attendance is therefore mandatory.**

The course is built in a coherent manner and missing lectures will create knowledge gaps making further learning extremely difficult. If a class is missed, it is the responsibility of the student to obtain all needed information from a classmate. Missed information includes not only lecture notes and handouts, but also any possible information regarding homework, syllabus changes, exam dates, etc.....
Students must be seated in the classroom **before** the start of the lecture. There will be neither eating nor chatting. Use of communication devices such as cell-phones and computers is not allowed.

**Notice to Students with Disabilities:**

Texas A&M University-Corpus Christi complies with the Americans with Disabilities Act in making reasonable accommodations for qualified students with disabilities. If you suspect that you may have a disability (physical impairment, learning disability, psychiatric disability, etc.), please contact the Services for Students with Disabilities Office, located in Driftwood 101, at 825-5816. If you need disability accommodations in this class, please see me as soon as possible.

**Academic Advising:**

The College of Science and Technology requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. The College's Academic Advising Center is located in Faculty Center 178, and can be reached at 825-6094.

**Grade Appeal Process:**

As stated in University Rule 13.02.99.C2, Student Grade Appeals, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Rule 13.02.99.C2, Student Grade Appeals, and University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules Web site at [http://www.tamucc.edu/provost/university_rules/index.html](http://www.tamucc.edu/provost/university_rules/index.html). For assistance and/or guidance in the grade appeal process, students may contact the Office of Student Affairs.
Textbook required


Non-classroom communication:

Access to Blackboard in mandatory. Students can stop by the instructor’s office during scheduled hours or request an appointment (yves.coeckelenbergh@tamucc.edu).

Anxiety and Stress:

The University Counseling Center (Driftwood: 825-2703) provides help for test anxiety, stress and study skills.

Conflicting schedules:

All students with conflicting schedules, including athletes, should ask an appointment with the instructor in order to evaluate the possibility to complete the course.

Class Conduct: All students are expected to follow proper classroom behavior and treat the other students and the instructor with respect. If a student’s actions or behavior is deemed disruptive to the class by the instructor, the students will be asked to leave the class until proper sanction is applied.

Academic Integrity and Honesty:

All students are expected to conform to college-level standards of ethics, academic integrity, and academic honesty. By enrolling in this course, you agree to be bound by the Regulations and Procedures published in the TAMU-CC STUDENT HANDBOOK. Group interactions, investigations, and studying are encouraged; however, duplicative work will be treated as cheating and will receive a grade of zero. Anything that is viewed as cheating on an exam will be given the most severe penalty possible, most likely an "F" for the course, but may include more severe punishments.
Provisional course outline:

The weekly schedule below is a preliminary outline of the lectures susceptible to be modified. The dates indicated are the Mondays of the corresponding weeks. It is the student’s responsibility to keep up with changes to this schedule. Some exams might be given during laboratory hours.

08/20 Lesson 1- Introduction
08/27 Lesson 2- Chemistry of the anthrosphere, Cycles, Green Chemistry
09/03 Lesson 3- Water chemistry, Acidity, Alkalinity, Solubility
09/10 Lesson 4- Water chemistry, Oxidation-Reduction, Phase interaction
09/17 Lesson 5 Water chemistry, Microbial biochemistry
09/24 Lesson 6- Water chemistry, Pollution, Treatment
10/01 Review and Exam
   10/02 Review
   10/04 First Exam
10/08 Lesson 7- Atmospheric chemistry, Atmosphere, Climate
10/15 Lesson 8- Atmospheric Chemistry, Particles, Inorganic air pollutants
10/22 Lesson 9- Atmospheric chemistry, Organic air pollutants, Smog
10/29 Lesson 10- Atmospheric chemistry, Climate
11/05 Review and Second Exam
   11/06 Review
   11/08 Second Exam
11/12 Lesson 11- Geosphere, Geochemistry, Agriculture, Green chemistry
11/19 Lesson 12- Waste and waste minimization
11/26 Lesson 13 – Toxicological chemistry
12/03 Exam
   12/04 Third Exam
12/06 Optional Final Exam (11H00-12H30)