Materials for Mitigating Climate Change

Instructor: Dr. Kevin S. Jones, 160 Rhines Hall (kjones@eng.ufl.edu) 352-846-3301, 352-219-6641 (cell)
Office Hours: By appointment

Class Time and Location: IDH3931 Section 01SS Class #23491 Tuesday’s 3rd period in Hume 119.

Objective: Explore the sources of climate change and how materials can be used to help mitigate this challenging problem

Overview
Climate change from rising CO₂ levels in the atmosphere is one of the greatest challenges humanity faces. A key question going forward is how do we reshape the world to address this problem and create a carbon neutral world. Materials discoveries have shaped our lives throughout our history and the discovery of new materials have solved many problems we have faced. The purpose of this course is to explore how new innovative materials can help address climate change. We will discuss the sources of CO₂, the feasibility of new materials to help create a carbon neutral world and how the implementation of these new materials may alter our lifestyle. Topics to be covered include discussions on how materials might be used to mitigate CO₂ associated with energy, housing, Industry, transportation, water etc. Finally, the use of materials to capture CO₂ from the atmosphere will be discussed. The goal of the class is in explore the challenges associated the CO₂ rise and start to envision what is needed for a carbon neutral world of the future.

Weekly Schedule

Week 1:
- Introduction to the green house gas effect
- Impact on global warming

Week 2:
- The CO₂ challenge and its sources
- How can materials science and engineering play a role

Week 3
- The role of electricity in CO₂ emissions
- Photovoltaics and materials challenges

Week 4
- Other renewable electricity sources
- Wind, wave, etc. and the associated materials challenges

Week 5
- No Class

Week 6
- Energy storage
- Methods of storing electric energy and the role of materials
- Magnitude of the problem and electrification of cars

Week 7
- Automotive Transportation
Week 8
   Planes, trains and bus
   Supercapacitors and biofuels

Week 9
   Homes and commercial buildings
   Current and Future Building Materials Building materials

Week 10
   Interior Building environment
   Heating, cooling and lighting buildings

Week 11
   Industrial sources of CO₂
   Energy and Transportation

Week 12
   Agriculture and livestock sources of CO₂
   Biofuels, paper and the role of materials

Week 13
   Carbon Sequestration
   Magnitude of the problem and traditional approaches
   Novel materials approaches being investigated

Week 14
   Envisioning a carbon neutral world in your lifetime
   What does your world look like and what’s different

Week 15
   Present posters/presentations orally to the class and discuss

Assignments:
   Final Project – short poster or presentation that will be presented to the class
   Reports – weekly challenges that will require some work – research topic to be covered the
   next week during class

Grades:
   30% Weekly challenges and participation
   50% Attendance
   20% Final Project
   A > 93, A- 90-92, B+ 86-89, B 83-85, B- 80-82, C+ 76-79, C 73-75, C- 70-72, D+ 66-69, D
   63-65, D- 60-62, F < 60

For more information:

Attendance:
   “Requirements for class attendance and make-up exams, assignments, and other work in this
course are consistent with university policies that can be found at:
   https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx.”

Accommodations:
   “Students with disabilities requesting accommodations should first register with the
Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate
documentation. Once registered, students will receive an accommodation letter which must
be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.”

Textbooks: No textbook is required

Evaluations:
“Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.”

Academic Integrity:
“UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (http://www.dso.ufl.edu/scrr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.”

Contact information for the Counseling and Wellness Center: http://www.counseling.ufl.edu/cwc/Default.aspx, 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

**Online Course Recording**
Our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

**COVID-19**

- You are expected to wear approved face coverings at all times during class and within buildings even if you are vaccinated.
- If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test & Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF Student Health Care Center at 352-392-1161 (or email covid@shcc.ufl.edu) to be
evaluated for testing and to receive further instructions about returning to campus.

- If you are withheld from campus by the Department of Health through Screen, Test & Protect, you are not permitted to use any on campus facilities. Students attempting to attend campus activities when withheld from campus will be referred to the Dean of Students Office.
- UF Health Screen, Test & Protect offers guidance when you are sick, have been exposed to someone who has tested positive or have tested positive yourself. Visit the UF Health Screen, Test & Protect website for more information.
- Please continue to follow healthy habits, including best practices like frequent hand washing. Following these practices is our responsibility as Gators.

Please either add the updated COVID-19 language to existing Fall 2021 syllabi or use the updated Fall 2021 HWCOE Undergraduate and Graduate course syllabus templates which may be found at this link on the HWCOE intranet: https://www.eng.ufl.edu/faculty/committees/curriculum-committee/academic-approval-requests/