

## Materials for Mitigating Climate Change

Instructor: Dr. Kevin S. Jones, 160 Rhines Hall ([kjones@eng.ufl.edu](mailto: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 3<sup>rd</sup> 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 CO<sub>2</sub> 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 CO<sub>2</sub>, 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 CO<sub>2</sub> associated with energy, housing, Industry, transportation, water etc. Finally, the use of materials to capture CO<sub>2</sub> from the atmosphere will be discussed. The goal of the class is in explore the challenges associated the CO<sub>2</sub> 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 CO<sub>2</sub> challenge and its sources
- How can materials science and engineering play a role

#### Week 3

- The role of electricity in CO<sub>2</sub> 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 CO<sub>2</sub>  
Energy and Transportation

Week 12

Agriculture and livestock sources of CO<sub>2</sub>  
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:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>.

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/](http://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/sccr/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 unmute 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](mailto: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/>