Syllabus: Chem 596, Advanced Special Topics in Chemistry: Energy and Fuels

Instructor: Dr. Yong Yan
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Class Schedule: Tues. & Thurs. 6:30-7:45 pm, GMCS-327
Office Hours and Location: By appointment on Tues. or Thurs., GMCS 213F

Textbooks and instruction materials: (Optional, Please do not buy)
1, Energy: Production, conversion, storage, conservation, and coupling (ISBN 978-4471-2372-9) 2018, Wiley
2, Renewable Energy: Power for a sustainable future (ISBN 978-0199545339) 2017, Wiley
3, Carbon Dioxide Utilisation: Closing the Carbon Cycle (ISBN: 9780444627469) 2014, Elsevier
4, ACS Journal access: Energy & Fuels
5, Electronic handouts: Frontier Publications in the Filed

Prerequisite
Required: Chem520A (*will not be enforced in 2021 spring semester*)
Preferably Chem427 and Chem520B

Course Description: This course is intended for Chemistry, Materials Science, Physics, and Geology majors, and is designed to prepare students for further research in Materials Science, Chemistry, Chemical Engineering, Nanotechnology, Renewable Energy or, more generally, employment in energy resources and fuel generation. The course content will include advanced concepts in chemical/physical properties and structures of solar energy, biofuels, general renewable energy sources and the current energy situation. The course will rely both on the books and literatures. Not all material in the text book will be covered and not all material covered will be found in the textbooks. Additional reading from primary literatures and presenting will be an integral part of this course. This course cannot be exhaustive in its coverage of all but it is hoped that it will serve as a rational foundation of self-development in further studies.

Major topics will include:

1) History and Current Advanced Topics in Energy and Fuels (length: 1 week)
2) Fundamental Concepts, Thermodynamics, and Introduction to Current Renewable Energy Related Topics. (2 week)
3) Solar Energy:
   3a) Solar cells: Principles, Major Semiconductors and Outlooks (2 week);
   3b) Solar fuels: Catalysis, Nanotechnology, and Functional Materials (2 week)
   3c) Photocatalysis and Electrocatalysis (2 weeks)
   3d) Solar thermoal (0.5 week)
4) Renewable Biofuels (3 weeks)
5) Other Renewable & Sustainable Energy topics: CO_2 capture and coversion (1.5 week)
6) Enery storage: Li-ion battery (2 weeks)
7) Fronteir renewable energy research discussion and prespective (length: 1 week)

Expected Outcomes:
Upon completion of Chemistry 596, students should be able to:
• Apply knowledge obtained in this class on critical thinking from chemistry perspective in the field of the overall energy and fuel research
• Define Energy concepts, knowledge, barriers and histories
• Analyze the direction of future possible renewable energy challenges and opportunities
• Utilize knowledge gained from this class to perform logic thinking and utilize concepts and theories to predict the properties of a device, such as solar energy device.
• Characterize energy devices (*i.e.* solar cell, lithium ion battery) by physical and spectroscopic means, including UV-vis, fluorescent, I-V curves etc.
• Demonstrate the skill sets necessary to continue on to further energy and fuel related research.

Examinations and Points:
Grading for graduate students:
Attendance and class performance: 10 points
Note: "Attendance" will be evualted via a signing up sheet for attendance on each class (60% points) .
"Class performance" is specified based on "in-class" discussion in which each and everyone should be involved, particularly in the "presentation section". Students will be evaluated based on "in-class" questions and discussion (40% points).

Presentations: 20 points
Note: presentation based on "Energy and Fuels" topic 15-30 minutes for each gradaute student. The grading for graduate is based on the clarity of the topic, background introduction, understanding the presentation topic, future presepctive of the topic, questions and answers based on the selected presentation topic and graduate student's future or current research interest that is related to the selected presentation topic.

In-class quiz: 20 points
Note: Three quizzess will be given in the class.

Homework: 20 points
Note: Two sets of homework will be assigned in week 2 and 10.

Final Exam: 30 points
Note: A paper-based final exam will be given at the end of semster.

Total points: 100points (100%)
Grading: A: 90-100%, A-: 85-89%, B+: 75-85% B:70-75% B-:65-70% C: 55-65%, D: 45-55%, F<45%

Grading for undergraduate students:
Attendance and class performance: 10 points

Note: "Attendence" will be evualted via a signing up sheet for attendance on each class (60 points) .
"Class performance" is specified based on "in-class" discussion in which each and everyone should be involved, particularly in the "presentation section". Students will be evaluated based on "in-class" questions and discussion (40 points).

Presentations: 20 points
Note: presentation based on "Energy and Fuels" topic 10-20 minutes for each undergradaute student.
The grading for undergraduate is based on the clarity of the topic, background introduction, understanding the presentation topic, quesitons and answers based on the presentation topic exclusively.

In-class quiz: 20 points
Note: Three quizzess will be given in the class.

Homework: 30 points
Note: Three sets of homework will be assigned in week 2, 6 and 10.

Final Exam: 20 points
Note: A paper-based final exam will be given at the end of semster.

Grading difference between gradaute student and undergradaute student:
Presentation percentage is 20% for gradaute student and also 20% for undergradaute student but more presentation content, particularly towards research related questions will be evulated on gradaute students presentation.
Homework percentage is 30% for undergradaute student and 20% for gradaute student.
Final exam: 20% for undergradaute while 30% for gradaute students. Final exam is an open exam.

Grading letter difference is also listed below.
Total points: 100points (100%)
Gradaute student Grading: A: 90-100%, A-: 85-89%, B+: 75-85%, B:70-75%, B-:65-70%, C: 55-65%, D: 45-55%, F<45%
Undergradaute student Grading: A: 90-100%, A-: 80-89%, B+: 75-80%, B:70-75%, B-:65-70% , C: 55-65%, D: 45-55%, F<45%

SDSU's Rest and Recovery Days policy: There will be no instruction, no assignments, no deadlines, and no exams during the Rest and Recovery Days on Friday, Feb. 12; Monday, March 8; Tuesday, March 30; Wednesday, March 31; or Thursday, April 15.

University Policies:
Accommodations: If you are a student with a disability and are in need of accommodations for this class, please contact Student Ability Success Center at (619) 594-6473 as soon as possible.

Please know accommodations are not retroactive, and I cannot provide accommodations based upon disability until I have received an accommodation letter from Student Ability Success Center.

Student Privacy and Intellectual Property: The Family Educational Rights and Privacy Act (FERPA) mandates the protection of student information, including contact information, grades, and graded assignments. SDSU e-mail will be used to communicate with you. Students will be notified at the time of an assignment if copies of student work will be retained beyond the end of the semester or used as examples for future students or the wider public. Students maintain intellectual property rights to work products they create as part of this course unless they are formally notified otherwise.

Religious observances: According to the University Policy File, students should notify the instructors of affected courses of planned absences for religious observances by the end of the second week of classes.

Academic Honesty: The University adheres to a strict policy prohibiting cheating and plagiarism. Examples of academic dishonesty include but are not limited to: ● copying, in part or in whole, from another's test or other examination; ● obtaining copies of a test, an examination, or other course material without the permission of the instructor; ● collaborating with another or others in work to be presented without the permission of the instructor; ● falsifying records, laboratory work, or other course data; ● submitting work previously presented in another course, if contrary to the rules of the course; ● altering or interfering with grading procedures; ● assisting another student in any of the above; ● using sources verbatim or paraphrasing without giving proper attribution (this can include phrases, sentences, paragraphs and/or pages of work); ● copying and pasting work from an online or offline source directly and calling it your own; ● using information you find from an online or offline source without giving the author credit; ● replacing words or phrases from another source and inserting your own words or phrases.
The California State University system requires instructors to report all instances of academic misconduct to the Center for Student Rights and Responsibilities. Academic dishonesty will result in disciplinary review by the University and may lead to probation, suspension, or expulsion. Instructors may also, at their discretion, penalize student grades on any assignment or assessment discovered to have been produced in an academically dishonest manner.