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Course: Renewable Energy

Course Description:

The Renewable Energy course provides introductory-level tutorials on the conversion principles and technologies in various clean energy sources, such as solar, wind, hydro, biomass, and geothermal. We examine the issues involved in the thermodynamics, design and operation of three main systems: solar, biomass, and hydro-power during the first four weeks of the class. We also discuss the integration of various clean energy sources and their economics. The second part of the class (last four weeks) are dedicated to enhancing the research experience of students, where three or more groups conduct independent research under my supervision. At the completion of this course, students are expected to:
• Understand the principles of operation of several clean energy technologies.
• Analyze the "system" aspects of clean energy technologies.
• Realize the technical and economic challenges of each system.
• Learn the fundamental physical principles of energy conversion.
• Learn research tools and write a report on the design, operation, integration, or economics of a selected system.

Examples of research projects are: design & operation of solar-thermal or solar-voltaic systems; design of energy storage systems; material selection in solar, hydro, biomass, wind, or ocean system; design &operation of wind, ocean, or biomass system; integration & economics of clean energy systems. Several research tools are taught to participating students during the second half of the class. These include: (1) technical writing of reports and papers; (2) research sources and references; (3) data representations and graphics; (4) renewable energy system design software and databases. Students are expected to spend three hours per week with the instructor, and a total of 8-10 hours per week on homework assignments and research projects

Evaluation:

Songyuan Liu was an excellent student in my class, which I taught online during the 10-week period: January 31 through April 11, 2021. He attended all lectures and participated enthusiastically in class discussions, showing a good level of understanding of the main issues that I presented in each lecture. I found him to be very motivated, given the fact that she spent many hours on the weekend to study the physical principles of several renewable energy technologies that I taught in this class. He is also a team player, having collaborated with two other team members, as well as with the class teaching assistant. Together with two other students: Zhaozhou Chen and Pengyu Zhang, Songyuan formed a research team and followed my instruction closely to formulate a research project on "Tidal Energy Technologies." On the last day of my class, the

team gave an extensive presentation, covering some of the key topics related to tidal energy systems. These included a historical background, physical principles (mainly principles of the moon's gravitational pull and earth's rotation), various embodiments of the technology, as well as the economics, environmental impact and future prospects. The team also followed my instructions to write a research project report on these topics in about 25 pages, including proper understanding of copyrights and references. Songyuan's final grade in my class (homework assignments, project, presentations, and discussions) was 90.4%, which is at the level of an "A" grade in similar introductory-level classes that I usually teach at UCLA. At a personal level, I found Songyuan to be quite motivated and eager to learn.

Based on my personal interactions with Songyuan Liu during this course, I would recommend him for your consideration in any program he may want to pursue. Please do not hesitate to contact me at my email address above if you have further questions.

Sincerely,

Nasr Ghoniem

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Fellow of the American Nuclear Society (ANS)
Fellow of the American Society of Mechanical Engineers (ASME)
Fellow of the American Academy of Mechanics (AAM)
Fellow of the Materials Research Society (MRS)
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