This course is unique in a sense that it provides a broad overview of energy storage technology and is not limited to either electrochemical batteries or fuel cells. No equivalent undergraduate courses are offered in other universities in the DC area. All teaching materials have been designed specifically for this course and are distributed to enrolled students free of charge.

The course covers the basic theory and methods of energy storage, with emphasis on electrochemical storage technology. Topics include introductory electrochemistry, chemical principles of operation and design of batteries and fuel cells, individual battery types (primary and secondary; lead-acid, nickel-cadmium, nickel-metal hydride, lithium ion, sodium-sulfur, flow batteries, and others), hydrogen and non-hydrogen fuel cells, operational issues of batteries and fuel cells, and selected non-chemical methods of energy storage.

This lecture course was originally developed at CUA for Electrical Engineering students enrolled in the Alternative Energy Program. It is offered in the Spring semester of each academic year, beginning with the Spring of 2011. Although the course is primarily oriented towards the needs of Engineering students, due to its multidisciplinary nature, it has also been taken by Chemistry, Biochemistry, and other majors.

Prerequisites include introductory General Chemistry (one semester of lecture and lab) and introductory Calculus courses.

**Course chapters**

1. Introduction
2. Mechanical methods of energy storage
3. Magnetic and thermal methods of energy storage
4. Basics of chemical thermodynamics
5. Chemical equilibrium
6. Chemical reactions in aqueous solutions
7. Oxidation-reduction (Redox) reactions
8. Basics of electrochemistry
9. Principles of battery operation, operational issues
10. Individual battery types
11. Battery charging and modeling. Use in hybrid vehicles
12. Fuel cells and fuel cell thermodynamics
13. Fuel cell kinetics and voltage losses
15. Hydrogen supply and hydrogen storage
16. Electric capacitors and supercapacitors

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Average course evaluations (2011 – 2014, course was not offered in 2015):
course: 9.0 out of 10  teacher: 9.7 out of 10