

**MSE 5390-03**  
**Materials for Energy**

**TuTh 11:00AM - 12:20PM, ERB 129**

- Goals:** The energy conversion and storage processes have certain limited efficiencies, cost factors and environmental effects, mainly due to limitation of materials. This course is to introduce fundamental materials development to improve the above factors and design advanced materials for different energy systems.
- Instructor:** Dr. Fuqiang Liu  
Office: 332 ELB  
Tel: (817) 272-2704  
Email: fuqiang@uta.edu  
Office hours: Tuesday and Thursday 1:00 to 3:00 pm (or by appointment)
- Text Book:**
- ✓ Introduction to Materials Chemistry, Harry R. Allcock, John Wiley & Sons, Inc., ISBN-13: 978-0470293331
  - ✓ Fuel Cell Fundamentals, Second Edition, Ryan O'Hayre, S-W Cha, Whitney Colella, and Fritz Prinz, John Wiley & Sons, Inc., ISBN-13: 978-0470258439
  - ✓ Solar Cell Device Physics, Second Edition, Stephen J Fonash, Elsevier Inc., ISBN: 9780123747747
- Exams** Two midterms and a final term project (is detailed below)
- Project:** One project will be given to students at the end of the semester. The topic should be related to energy generation or storage - an energy problem or a new design. Discussion with the instructor on selecting the subject is encouraged. A review with an extensive literature analysis and a comprehensive mastery over the subject are expected. The project will be presented in class. A report with minimum 5 pages is required (format is flexible).
- Grading:** Homework (20%), 2 midterms (40%), and Final Project and presentation (40%)
- Note: typical grading policy is >85 A, 75-84 B, 65-74 C, 55-64 D, and <55 F

Attendance will be taken and bonus points may be offered to students who miss only 2 or fewer classes.

## Course Outline

- 1. Introduction to Material Chemistry** (small molecules in solids, polymers, semiconductors, metals, alloys, composites, and defects)
- 2. Materials in advanced technology**
  - a. Fuel cell materials (nanomaterials, polymers)
  - b. Battery materials (electrolyte materials and electrode)
  - c. Solar Cells (semiconductors)
  - d. Hydrogen production (catalysts and nanomaterials)
  - e. Energy harvesting (e.g., piezoelectric materials)
  - f. Thermoelectric Materials
  - g. Materials for Other Emerging Energy Generation and Storage Processes
  - h. Capacitors and supercapacitors
  - i. Challenges for the future

### **Classroom Behavior**

Students should NOT hold conversations.

Wireless communications devices MUST be silenced or turned off.

### **American with Disabilities Act**

The University of Texas at Arlington is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 93112 - The Rehabilitation Act of 1973 as amended. With the passage of new federal legislation entitled Americans with Disabilities Act (ADA), pursuant to section 504 of the Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens.

As a faculty member, I am required by law to provide “reasonable accommodation” to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests with informing faculty at the beginning of the semester and in providing authorized documentation through designated administrative channels. If you require an accommodation based on disability, I would like to meet with you in the privacy of my office during the first week of the semester to make sure that you are properly accommodated.

### **Academic Dishonesty**

It is the philosophy of the University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University.

“Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the

attempt to commit such acts.” (Regents’ Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22)

In particular, it is expected that in the course of taking an examination, students will NOT (1) accept information of any kind from others; (2) use any material that is unauthorized by the examiner;(3) use aids to memory other than those expressly permitted by the examiner.

Following an examination, students will not try to deceive the instructor by misrepresenting or altering their previous work.

For homework, students can discuss questions with each other, but each student must write the answers in his/her own words.