

# **Vm 434 Materials for Energy Conversion Fall 2016**

**University of Michigan-Shanghai Jiao Tong University Joint Institute**

- Instructor:** Qianli Chen  
qianli.chen@sjtu.edu.cn,  
Phone: 34206765 ext. 2171  
Office: JI building 217  
Office Hours: Friday 10 – 11:30 pm, other time by appointment
- Lectures:** Wednesday & Friday 8:00 – 9:40 am, F403 Dong Xia Yuan
- Teaching Assistant:** Miao Yihe  
yihemiao@163.com
- Books:** Kathy Lu, “Materials in Energy Conversion, Harvesting, and Storage”  
Callister & Rethwisch, “Materials Science and Engineering: An Introduction”  
Kittel, “Introduction to Solid State Physics”, 8th ed.  
Averill & Eldredge, “Principles of General Chemistry”
- Course topics:** Vm434 provides an overview about materials used in advanced renewable energy conversion and storage systems and devices, including solar cells, batteries, fuel cells, photoelectrochemical cells and hydrogen storage. It begins with an introduction to energy conversion and storage issues. The operating principles of energy conversion and storage devices are discussed next. The remainder of the course focuses on the material structure, physics and chemistry, material design and the processing approaches to enhance the performance for the energy conversion and storage devices.
- Homework:** In-class exercises and homework will be assigned frequently to help learning. You are expected to read books, course materials, and discuss actively with each other to solve the exercise and homework problems, but you should hand in your unique version.
- Exam:** There will be one midterm and one final exam.
- Project:** You are required to form groups of 3 and study a topic related to the energy conversion devices. You can also choose to describe your own creative ideas, for which you will get bonus points. More details about the topics will be announced during the class. Each group will give a presentations of 25 minutes + 5 minutes Q&A.
- Grading:** In-class exercises +

Homework	26%
Lab report	4%
Project	25%
Midterm	20%
Final	25%

**Honor code refresh:** All students in the class are presumed to be bound by the Honor Code of the Joint Institute (see JI's Student Handbook for Undergraduate Students for more details). Any violation of the honor polices will be reported to the Honor Council, and if guilt is established penalties may be imposed.

### Lecture Schedule (subject to change)

Date	Topic
9/14	Introduction to Energy Issues,
9/18	Energy Conversion & Storage Devices
9/21	Crystal Structure
9/23	Chemical Bonding
9/28	Concepts in Quantum Mechanics; Phonons, Thermal Properties
9/30	Electrical Conductivity; Energy Bands
10/12	Semiconductors
10/14	Electrochemistry
10/19	Ionic Conductivity
10/21	Midterm Review
10/26	Midterm Exam
10/28	Solar Cells
11/2	Solar Cells; Thermoelectric energy conversion
11/4	Lab: solar cell I-V characteristics
11/9	Electrochemical Energy Storage
11/11	Batteries
11/16	Fuel Cells
11/18	Hydrogen Storage
11/23	Hydrogen Generation, Photoelectrochemical Cells
11/25	Project Presentation
11/30	Project Presentation
12/2	Final Review
12/7	No class
12/9	Final Exam