

## CHEM 597 Advanced Research Techniques and Design, Summer 2015

**Course Description:** Three semester hours. Prepare students to carry out research project assignments effectively. Prerequisites: Chem 521 & CHEM 597 Advanced Research Techniques and Design I or consent of the instructor.

**Class Time and Location:** Lecture— R 8:00-9:00am; Sci 356  
Laboratory—10-20 hours/wk; Sci 348, 349, 328 or 305

**Instructor:** Dr. Ben Jang; Sci 335, x5383, ben.jang@tamuc.edu

**Office Hour:** WR: 2:30pm-4:00pm

**Goals of the Course:** Provide advanced training on the theories and practices of heterogeneous catalysis. Learning outcomes include advanced techniques to systematically prepare various supported metal catalysts and/or acid/base catalysts, refined skills to carry out various catalyst characterization techniques and to analyze the results independently, the detailed knowledge and practices to design and setup of reaction systems for various heterogeneous catalytic reactions and in-depth skills in project report preparation.

### Course Requirements and Assignments:

#### References:

Heterogeneous Catalysis in Practice, 2nd Ed., Charles Satterfield, 1996  
Introduction to Surface Chemistry and Catalysis, Gabor A. Somorjai, 1994.  
Gasser, R. P. H. (Robert Paul Holland) An introduction to chemisorption and catalysis by metals / R.P.H. Gasser. Oxford: Clarendon Press ; New York : Oxford University Press, c1985.  
Spectroscopy in heterogeneous catalysis / by W. N. Delgass et al.. New York : Academic Press, 1979  
Introduction and Practice of Heterogeneous Catalysis, J.M. Thomas and W.J. Thomas, 1997.

**Assignments:** Assignments will normally be given in the beginning of each week. Each assignment is due normally a week later.

#### Grading Procedure:

Weekly Assignments: 30%  
2 Presentations: 20%  
Progress Reports and Final Report: 50%

**A:**  $\geq 90.0$ ; **B:** 80.0 ~ 89.9; **C:** 70.0 ~ 79.9; **D:** 60.0 ~ 69.9; **F:**  $< 60.0$

### Student Learning Outcomes:

At the end of this course students should demonstrate the skills and knowledge in the following

areas:

1. Effective use of various literature search methods and database.
2. Comprehensive understanding of various instrumentations related to the project.
3. Critical analysis of literature and data.
4. Comprehensive understanding of safety issues related to the selected project.
5. Applying scientific methods to solving education-related problems.
6. Mastery of research techniques related to the project.
7. The requirements of professional scientific reports and journal publication and the manuscript preparation.

### **Attendance Policy:**

The Department of Chemistry adheres to the attendance policy set by the University as stated in the most current Catalog. The attendance record is kept by spot check. Being more than 5 minutes late or missing a daily assignment is equivalent to missing a lecture. Excessive absence is defined as missing more than 10% of the lectures without excusable reasons. In addition, **according to the TAMU-Commerce Procedure A13.02, if a student has excessive absences, the instructor may drop the student from the course.** The instructor will only excuse an absence if the student provides, with appropriate documents an excusable reason allowed by the TAMU-Commerce Procedure A13.02.

### **Student Conduct Policy:**

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment (see Student's Guidebook, Policies and Procedures, Conduct, TAMU-Commerce Procedure 13.02.99.R0.06). Any student engaging in disruptive behavior will be dismissed from class on the first offence. A second offence may constitute dismissal from the course with a failing grade.

### **Cheating and other Breaches of Academic Conduct:**

Academic cheating, plagiarism, and other forms of academic misconduct may result in removal of the student from class with a failing grade or may in extreme cases result in suspension or expulsion from the University as described in the Code of Student Conduct section of the Student's Guidebook A&M-Commerce Procedure 13.99.99.R0.10.

### **Students with Disabilities:**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an

accommodation, please contact: Office of Student Disability Resources and Services, Texas A&M University-Commerce, Gee Library, Room 132, Phone (903) 886-5150 or (903) 886-5835, Fax (903) 468-8148, [StudentDisabilityServices@tamuc.edu](mailto:StudentDisabilityServices@tamuc.edu)

**Dishonesty:**

The reports must be written by the student. Any instance of cheating will result in a grade of “F” and result in dismissal from the course. Freedom to discuss problems does not mean that you can copy other peoples work. You must develop individual reports of your own. Blatant plagiarism will result in a grade of “F” for the course. Proven offenders will be dismissed from the research.

**Tentative Schedule:** (Typically 16h/wk of lab/literature assignments is expected)

*WK 1-2: Literature Review & Lab Training*

*WK 2-3: Catalyst Preparation*

*WK 3-10 Catalyst reaction testing, catalyst characterization, bi-weekly progress report & catalyst modification and preparation if necessary*

Catalyst characterization may include the following instrumentation depending on the project: TGA, DSC, TPR/TPD, Chemisorption, FT-IR, surface area/pore size distribution, etc.

*WK 10: Final Report*