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## Texas A&M University-Kingsville, The Department of Chemistry Chemistry 5412 Spring 2012 Syllabus

**Course number and name: CHEM 5412: Nano Chemistry**

**Course Description:** Nano Chemistry, a course designed primarily for graduate students majoring in a field of science, agriculture, or engineering. A study of Nano chemistry is featured current advances and trends. Three (3.0) hours of lecture are offered per week.

**Course Prerequisites:** Completion of undergraduate courses or follow the departmental requirement.

**General education requirements:**

This course is one of the graduate education requirements for Texas A&M University-Kingsville, and satisfies the component area, Chemistry. Included, but not limited to:

1. Methodologies for Nanotechnology  
Fabrication, Characterization
2. Processing and Properties of Nanomaterials  
Thermodynamics and Synthesis Methods  
Structure and Electronic Properties
3. Self-assembly of Nanostructured Materials and Devices  
Principle of Self-Assembly, Methods of Self-Assembly, Templated Structure
4. Electronic and Electro-Optical Materials and Devices  
Concepts and Materials, Application and Devices
5. Nanomagnetic Materials and Superconductor  
Nanomagnetic Materials, Superconductor
6. Green Energy Resources: Fuel Cell and Solar Cell  
Classification, Construction, Application
7. Green Energy Resources: Hydrogen Storage and Carbon Dioxide Capture  
Classification, Construction, and Application

**Name of instructor and academic rank, office location, phone and fax numbers, email address:**

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Nierman Science Hall 106A  
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**Office hours:** M, T & R 14:00 – 17:30 (Nierman Science Hall 106A or N200)

### **Course learning objectives:**

The learning objectives of this Nano Chemistry include the following (note: selected from the mission of NSF CHE, [http://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=503422&org=CHE&from=home](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503422&org=CHE&from=home)).

- Provide students with knowledge on novel synthesis relevant innovative surface functionalization methodologies, surface monolayer chemistry, template-directed synthesis, and the formation of clusters, aggregates, nanoparticles' architectures.
- Allow students for understanding self-assembly into discrete structures; understanding unique chemical and physicochemical properties and reactivities that result from the organized or nanoscopic structures; the study of green energy composed of nanomaterials will provide students with frontier knowledge and prepare them for global competition
- Know how to use advanced experimental methods to understand or to predict the chemical structure, properties and reactivities of unique nanostructures.

### **Required and optional textbook(s):**

Text for the course will be offered by Dr. Liu.

### **Suggested readings:**

Additional reading materials will be available on reserve at the library.

### **Useful website locations for study and/or research materials:**

[Users.tamuk.edu/kfj1100](http://Users.tamuk.edu/kfj1100)

[http://www.wiley.com/WileyCDA/WileyTitle/productCd-0470020865\\_descCd-reviews.html](http://www.wiley.com/WileyCDA/WileyTitle/productCd-0470020865_descCd-reviews.html)

[www.nsf.gov](http://www.nsf.gov)

### **Student learner outcomes:**

- The facts of dimensionality in nanosystem;
- The electronic properties of atoms in solid;
- Generic methods for nanotechnology (fabrication and characterization such as analytical imaging and microscopic techniques);
- The relationship between microstructural scale and its influence on physical mechanism;
- The approach to scale-up the nanomaterials manufacture;
- The design of materials on nanoscale through molecule-by-molecule method or self-organization method;
- The panoply of nanostructures for devices application;
- The chemistry of carbon (nanotubes), field effect transistor, and photovoltaics;
- The subtle and complex magnetic interaction produced by the nanomagnetic devices;
- The phenomena of superconductors, zero electrical resistance, superconducting phase transition, Meissner effect, London moment;
- The working principle and application of proton exchange membrane fuel cell and solid oxide fuel cell;
- The conversion of sunlight into electricity or fuels;
- The development, application, and environmental impact of photovoltaics.

### **Method(s) of evaluation and grading procedures**

There will be six required assessment exams and two make-up exams, each worth 100 points, and a comprehensive final exam worth 200 points. In addition, each student will complete the on-line (ARIS) homework (worth 150 points). The grading guideline is listed in the following table.

### Grading Guidelines

<u>Grading System</u>	<u>Point Grade</u>	<u>Letter Grade</u>
Final grade is based upon the total number of points accumulated during the semester. The "Q" grade is enforced in accordance with university guidelines.	3 assessment Exams*                      1000 pts	A ≥ 900 pts B 800–899 pts
	TOTAL                                              1000 pts	C 700–799 pts D 600–699 pts F <600 pts

\*Each assessment exam includes a 10 % bonus, three assessment exams will be totaled at 1000 pts.

- Policy for dropping the course: **follow the university calendar**;
- A letter grade of "F" is recorded if a < 50% average is obtained on the assessment examinations offered up to the date of the drop.

It is the responsibility of the student to keep the *original graded* copies of all materials (assessment exams, problems sets, in-class assignments, etc.) that have been returned for his/her records. Graded *final* assessment exams are retained by the instructor for his/her permanent records.

<b>Important Dates</b>	
First Class Date (For University on Wed/Jan/18/2012)	Wed/Jan/18/2012 (for CHEM 1312)
12th Class Date. No registration after this point	Thu/Feb/02/2012
Five week Date	Wed/Feb/22/2012
Spring Break	Mon/Mar/12/2012 → Sun/Mar/18/2012
Last day to drop the course with an “automatic “Q” Date	Thu/Mar/22/2012
Good Friday Holiday	Fri/Apr/06/2012
The last day to drop the course or withdraw from the university	Thu/May/03/2012 by 5:00 pm
Last Class Date (For University on Thu/May/03/2012)	Wed/May/02/2012 (for CHEM 1312)

This NanoChemistry 5412, Spring 2012 Syllabus is intended to be informational and not contractual. The instructor reserves the right to amend, alter, change, delete, or modify the syllabus with notice (announced during the lecture session) in any manner that is deemed necessary and in the best interest of the Department of Chemistry and Texas A&M University-Kingsville.

#### Topical course outline/course schedule:

Week	Date	
1	Jan 18, 2012	Syllabus Review <i>Methodologies for Nanotechnology</i> : Classification and Fabrication
2	Jan 25, 2012	<i>Methodologies for Nanotechnology</i> : Fabrication and Characterization
3	Feb 01, 2012	<i>Processing and Properties of Nanomaterials</i> : Thermodynamics and Synthesis Methods, Structure and Electronic Properties
4	Feb 08, 2012	<i>1<sup>st</sup> Assessment Exam (Materials Covered in Class)</i> <i>Methodologies for Nanotech and Properties of Nanomaterials</i>
5	Feb 15, 2012	<i>Self-assembly of Nanostructured Materials and Devices</i> :

		Principle of Self-Assembly
6	Feb 22, 2012	<b><i>Self-assembly of Nanostructured Materials and Devices:</i></b> Methods of Self-Assembly and Templated Structure
7	Feb 29, 2012	<b><i>Electronic and Electro-Optical Materials and Devices:</i></b> Concepts and Materials
8	March 07, 2012	<b><i>Electronic and Electro-Optical Materials and Devices:</i></b> Application and Devices <i>2<sup>nd</sup> Assessment Exam (Materials Covered in Class)</i> <b><i>Self-assembly and Electronic and Electro-Optical</i></b>
9	March 21, 2012	<b><i>Nanomagnetic Materials and Superconductor:</i></b> Nanomagnetic Materials
10	March 28, 2012	<b><i>Nanomagnetic Materials and Superconductor:</i></b> Superconductor
11	April 04, 2012	<b><i>Green Energy Resources: Fuel Cell and Solar Cell :</i></b> Classification and Application of Fuel Cells, Solar Energy and Solar Cells
12	April 11, 2012	<b><i>Green Energy Resources: Fuel Cell and Solar Cell :</i></b> Classification and Application of Fuel Cells, Solar Energy and Solar Cells
13	April 18, 2012	<b><i>Green Energy Resources:</i></b> H <sub>2</sub> storage and CO <sub>2</sub> capture
14	April 25, 2012	<i>3<sup>rd</sup> Assessment Exam (Materials Covered in Class)</i> <i>Magnetic Materials and Green Energy</i>
15	May 02, 2012: Last day of class	

## Policies

### **Disability statement:**

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 disability. If you believe you have a disability requiring an accommodation please contact the Disability Resource Center (DRC) as early as possible in the term. DRC is located in the Life Service and Wellness building at 1210 Retama Drive, or call (361) 593-3024.

### **Academic misconduct statement:**

You are expected to adhere to the highest academic standards of behavior and personal conduct in this course and all other courses. Students who engage in academic misconduct are subject to university disciplinary procedures. Make sure you are familiar with your Student Handbook, especially the section on academic misconduct, which discusses conduct expectations and academic dishonesty rules.

### **Forms of academic dishonesty:**

- 1) **Cheating:** Using unauthorized notes or study aids, allowing another party to do one's work/exam and turning in that work/exam as one's own; submitting the same or similar work in more than one course without permission from the course instructors; deception in which a student misrepresents that he/she has mastered information on an academic exercise that he/she has not mastered; giving or receiving aid unauthorized by the instructor on assignments or examinations.
- 2) **Aid of academic dishonesty:** Intentionally facilitating any act of academic dishonesty. Tampering with grades or taking part in obtaining or distributing any part of a scheduled test.
- 3) **Fabrication:** Falsification or creation of data, research or resources, or altering a graded work without the prior consent of the course instructor.
- 4) **Plagiarism:** Portrayal of another's work or ideas as one's own. Examples include unacknowledged quotation and/or paraphrase of someone else's words, ideas, or data as one's own in work submitted for credit. Failure to identify information or essays from the Internet and submitting them as one's own work also constitutes plagiarism.
- 5) **Lying:** Deliberate falsification with the intent to deceive in written or verbal form as it applies to an academic submission.
- 6) **Bribery:** Providing, offering or taking rewards in exchange for a grade, an assignment, or the aid of academic dishonesty.
- 7) **Threat:** An attempt to intimidate a student, staff or faculty member for the purpose of receiving an unearned grade or in an effort to prevent reporting of an Honor Code violation.

Please be aware that the University subscribes to the Turnitin plagiarism detection service. Your paper may be submitted to this service at the discretion of the instructor.

### **Other Forms of Academic Misconduct:**

- 1) Failure to follow published departmental guidelines, professor's syllabi, and other posted academic policies in place for the orderly and efficient instruction of classes, including laboratories, and use of academic resources or equipment.
- 2) Unauthorized possession of examinations, reserved library materials, laboratory materials or other course related materials.
- 3) Failure to follow the instructor or proctor's test-taking instructions, including but not limited to not setting aside notes, books or study guides while the test is in progress, failing to sit in designated locations and/or leaving the classroom/ test site without permission during a test.
- 4) Prevention of the convening, continuation or orderly conduct of any class, lab or class activity. Engaging in conduct that interferes with or disrupts university teaching, research or class activities such as making loud and distracting noises, repeatedly answering cell phones/text messaging or allowing pagers to beep, exhibiting erratic or irrational behavior, persisting in speaking without being recognized, repeatedly leaving and entering the classroom or test site without authorization, and making physical threats or verbal insults to the faculty member, or other students and staff.
- 5) Falsification of student transcript or other academic records; or unauthorized access to academic computer records.
- 6) Nondisclosure or misrepresentation in filling out applications or other university records.
- 7) Any action which may be deemed as unprofessional or inappropriate in the professional community of the discipline being studied.

### **Non-academic misconduct:**

The university respects the rights of instructors to teach and of students to learn. Maintenance of these rights requires campus conditions that do not impede their exercise. Campus behavior that interferes with these rights will not be tolerated; examples include

- 1) interfering with the instructor's ability to conduct the class,
- 2) causing inability of other students to profit from the instructional program, or
- 3) any interference with the rights of others.

An individual engaging in such disruptive behavior may be subject to disciplinary action. Such incidents will be adjudicated by the Dean of Students under non-academic procedures.

Ongoing behaviors or single behaviors considered distracting (e.g., coming late to class, performing a repetitive act that is annoying, sleeping or reading a newspaper in class, etc.) will be addressed by the faculty member initially either generally or individually. Cases in which such annoying behavior becomes excessive and the student refuses to respond to the faculty member's efforts can be referred to the Dean of Students. In the case of serious disruptive behavior in a classroom the instructor may first request compliance from the student and if it is not received, an instructor has the authority to ask the student to leave the classroom. If the student fails to leave after being directed to do so, assistance may be obtained from other university personnel, including University Police Department. An individual engaging in such disruptive behavior is subject to disciplinary action. Such incidents will be adjudicated by the Dean of Students under non-academic procedures to determine if the student should be allowed to return to the classroom.

### **Harassment /Discrimination:**

Texas A&M University-Kingsville will investigate all complaints that indicate sexual harassment, harassment, or discrimination may have occurred by the facts given by the complainant. Sexual harassment of anyone at Texas A&M University-Kingsville is unacceptable and will not be tolerated. Any member of the university community violating this policy will be subject to disciplinary action. A person who believes he/she has been the victim of sexual harassment, harassment, or discrimination may pursue either the informal or the formal complaint resolution procedure. A complaint may be initially made to the complainant's immediate supervisor, a department head, any supervisory employee, the Dean of Students (593-3606), or the Office of Compliance (593-4758). Regardless of who the complaint is filed with, the Compliance Office will be notified of the complaint so it can be investigated.

### **Six-drop policy:**

The following provision (new in Fall 2007) does not apply to students with Texas public college or university credits prior to Fall 2007. The Texas legislature has enacted a limit to the number of course drops allowed to a student without penalty. After a student has dropped six courses, a grade of QF will normally be recorded for each subsequent drop. If you need additional information on Senate Bill 1231 and how it affects you, please contact the Registrar's Office in College Hall, Room 105.

### *Course Policies*

1. **Attendance Policy:** Attendance to all class lectures is not only **mandatory** but also an obligation for a comprehensive understanding of the chemical principles of Chemistry 5412-801. Class and your attendance begin "at the top of the hour!". Daily class attendance will be recorded and evaluated. **Persistent absences will be cause for being dropped from the course. Policies for attendance, excused absences, make-up exams, late assignments, early final exams, cell phones, etc.:**

Successful performance in this class requires that you attend class. Make-ups for missed exams are granted only for excused (official university) absences. Please note that attendance policies may vary by college. No late assignments will be accepted. Graduating seniors who need to schedule an early final should inform the instructor early in the semester. Students should turn off and stow their cell phones during class.

2. **Assessment Examination Makeup Policy:** No individual makeup assessment exams are offered for Assessment Exams 1, 2, 3 (**for whatever reason**). Students can NOT miss the exams unless the official documents are provided.

3. **Assessment Examination Corrections Policy:** Graded assessment exams will be returned as soon as possible only during your assigned lecture sections or during the instructor's office hours. The keys of assessment exams will can be reviewed in Dr. Liu's office if there are any questions on their grades. Any corrections to the scoring of the assessment examinations are to be requested within three (3) class days of its return.

4. **Classroom Etiquette Policies:** (a) The use of tobacco of any form, cellular phones, walkmans, and any other electronic equipment are prohibited from operation in lecture without prior approval of the instructor. (b) You are to be on time at the beginning of the lecture period. (c) Falling asleep during the lecture period is considered rude and disrespectful to peers and the instructor! (d) Professional character and respect and consideration for others are required at all times. Abusive disregard of these policies will result in dismissal from **Chemistry 5412-801**.

### **Assessment Examination policies**

1. Do not miss the assessment examination. No makeup assessment examinations are provided for single assessment exams. Should you miss an assessment examination (for *whatever* reason) you may use the end-of-semester Makeup Assessment Examination as a substitute assessment examination.

2. All assessment exams will be taken in the Student Union building. The exact location will be given prior to the first exam.

3. Bring the following to the assessment examination:

- A&M–Kingsville ID card that is to be available for viewing on your desk during the assessment examination and when your assessment exam is submitted. Failure to do will result in a "zero" for the assessment exam grade.
- A working calculator (programmable calculator is allowed). Calculators may *not* be shared during the assessment examination (even if yours "craters") and all instruction booklets and calculator covers/cases must be removed. The calculator must lay face down on the table when it is not in use!
- **Do not bring scratch paper or a Periodic Table.**
- All other material (books, class notes, backpacks, . . . ) must be left at the front or outside of the classroom during the assessment examination unless specified.

### **During the assessment examination**

1. Prepare, *in advance*, to systematically address the assessment examination. What is your best strategy for taking assessment exams?

2. Do not waste time! After you receive the assessment exam, but before you begin recording your answers, scan over the number of pages and the types of questions.

3. Do your own work! Any unethical modes used to complete the assessment examination will result in an automatic "drop" from the course and possible expulsion from the university.

4. All "**show-your-work**" exercises must be systematically setup and work shown; answers must be correctly expressed, labeled, and boxed.

5. If "nature calls" during the assessment examination, be absolutely certain that the instructor is aware of your sudden departure. "Nature" can call only once during the assessment examination.

6. Turn in your assessment exam when "Time is up!"

### **After the assessment examination**

After the assessment examination is returned, you will have three (3) university class days to request any corrections to the scoring of the assessment examination. All corrections to the assessment exam are to be requested only once; therefore, review the entire assessment exam before making any requests. *Any unethical modes used to change the assessment examination after it has been graded and returned will result in an automatic "drop" from the course and possible expulsion from the university.*

**FINAL EXAM SCHEDULE FOR SPRING 2012: Follow the University Calendar.**