Chemical Technology – Lecture/Lab

CHEM 301

Section 003 (W) 8:30 AM – 12:55 PM FMH 305 & T209

Section 103 (M) 5:45PM – 9:35PM; T105 & T209

Fall 2016 September 6, 2016 – December 22, 2016

Dr. Miriam Gulotta **E-mail:** Gulotta@njit.edu **Office:** 323B Tiernan Hall

Office Hours: M 3:00P – 4:00P, T 2:30P – 4:00P, W 2:40P – 4:30P, R 5:30P – 6:30P or by apt.

Textbook: Chemistry for Engineering Students, Brown & Holme, 3rd Ed. (2015) *required*
OWLv2*:* Online textbook and homework *optional*
Both may be purchased through the bookstore or through the publisher – see Moodle link

Lab: 1) Chemistry 301 Lab Manual Fall 2016. *Required* & *Available through the bookstore*
2) Goggles *Required*. A small number are available on a first come first serve basis. It is strongly recommended that you purchase a pair of goggles.

Scientific calculator: capable of handling logs & exponentials. No cell phone, programmable or any other multi-tasking calculator will be permitted on exams.

Evaluation: This is a lecture & laboratory course. You must pass both the exam and lab report sections independently to pass the class. **Attendance is mandatory**. One or two absences due to illness or emergency and verified by the Dean's Office will not count against you but missing three classes for *any reason* will result in a failing grade.

1. Exam Grade (60%): the average of the top 2 exams plus the homework grade or of the 3 exams (whichever is higher). So either the lowest exam grade OR the cumulative homework/quiz grade will drop.
    a. 3 exams will be given.
    b. There are no makeup exams and the course has no final exam.
    c. The only exam extra credit comes from extra credit problems appearing on the exams.
2. Homework/quiz: the cumulative homework/quiz score counts as an exam.
    a. Written homework assignments are either assigned from the book or posted in Moodle. I will go over the homework in class.
    b. You must show your work to get credit on homework problems.
    c. A quiz on one problem may be given in class.
    d. Written assignments are *due at the start* of your lecture class. Written assignments may also be turned in via email. Assignments sent via email will count if and only if the email is received before class time on the due date. A return receipt will be sent for accepted homework. If I do not receive it, it does not count.
    e. To take the quiz you must attend the lecture and be there when the quiz is given.
    f. Late homework will *not* be accepted.
    g. The lowest homework and quiz grade drops.
    h. Grading is both effort & answer based and will be scaled at the end of the semester.
        i. Show your work for all written assignments!
        ii. If you are confused make an attempt at solving the problem and try to let me know where you are stuck. Chances are you are not alone.
3. OWL assignments are optional and there to help with problem solving and exam preparation.
4. Class participation (15%): includes attendance (on time), asking as well as answering questions.

5. Laboratory score (25%):
    a. Students perform experiments in lab groups. Unless stated otherwise, each group hands in one lab report or worksheet. **A lab group consists of no more than 3 people** who share an experimental set up as well as data. Groups of 4 or more will be penalized. Multiple groups working together and sharing results are cheating. The minimum penalty for cheating in lab is a zero for the lab as well as a zero for attendance. Grades due to cheating cannot be dropped.
    b. 85% Results & interpretation: properly done calculations and appropriately answered questions on lab worksheets, as well as justification of results - If your results don't make sense analyze why; the accuracy and precision of your results (good technique). *You cannot submit data you did not acquire yourself.* Putting your name on a lab you were absent for will result in a penalty to your total lab score as well as a penalty to others in the group.
    c. The lowest lab grade is dropped.
    d. 15% Instructor Evaluation based on in-lab technique, participation, following safe laboratory procedures (like wearing goggles over your eyes), and lab cleanliness (for example, cleaning any spilled material from around the balances.

The laboratory should look the same at the beginning & end of the lab.

- Glassware used is clean, unbroken, & put away properly or put back where it was originally.
- Common areas are clean, reagent containers are closed, & materials used are properly stored. If my TA and I have to clean up after the class has left, it will hurt everyone.

Learning Outcomes:

- Analyze problems using the scientific method.
- Make computations using metric system units & be able to convert between units.
- Factor in experimental limits in precision when doing calculations.
- Explain how atomic components and their arrangement dictate periodic trends.
- Form ionic compounds from constituent metals, nonmetals, and polyvalent ions.
- A basic understanding of covalent bonding.
- Apply conservation of mass to balancing chemical reactions.
- Determine empirical and molecular formulas
- Balance chemical equations.
- Determine quantities of reactants required or of products produced in a given chemical reaction using the principles of stoichiometry.
- Determine concentrations of aqueous solutions: molarity, mole fraction.
- Determine volumes or concentrations of reactants required or of products produced in a given aqueous reaction using the principles of solution stoichiometry.
- Determine unknown concentrations in acid-base titration reactions.
- Use concentration or density to convert between volume and mass.
- Analyze the effects of intermolecular forces on liquid systems in terms of their effects on physical properties including boiling points, vapor pressure, and solubility.
- Describe the flow of electrons in oxidation-reduction reactions.
- Analyze the conversion and transfer of energy or heat in a chemical reaction.
- Understand the difference between thermodynamic & kinetic effects.
- Analyze voltaic (Galvanic) cells
- Compute cell potentials.
- Understand the operation of batteries & fuel cells

Exam dates (*tentative*):

Exam 1	Sept. 28 (W) & Oct. 3 (M)	= 3 x 20% = 60%	= 75%
Exam 2	Nov. 2 (W) & Nov. 7 (M)		
Exam 3	Dec. 12 (M) & Dec. 14 (W)		
Homework/Quiz			
Participation		= 15%	

Laboratory ------ ----- = 25%

Total ≈ **100%**

Chem301 Fall 2016 LABS		
Lab#	**Lab title**	**Topics covered**
1	Measurements and Density	Metric system, dimensional analysis, precision & accuracy
2	Making Soap	real world example of a chemical reaction
3	Determination of the Chemical Formula with the form $[Cu_xCl_y]\bullet ZH_2O$	empirical formula determination, ionic compound, hydrate
4	Acid Base Titration Reactions	acid-base chemistry; titration reaction & end point, indicators; solution stoichiometry
5	Synthesis of Zinc Iodide	Conservation of mass, balancing chemical reactions, limiting reagent, %yield
6	Solutions & Solubility	molarity, solubility, intermolecular forces, electrolytes
7	Calorimetry	calorimetry, specific heats, heat of solvation, enthalpy
8	Isolation of Pigments from Spinach	physical separation (TLC); intermolecular forces; real world example
	Extended Class	
9	Talk	*real world application*
10	Experiments on Batteries	galvanic cells, unit cells, batteries, electrochemistry

Important Dates:

FALL 2016 Calendar			
month	date	day	event
September	5	Monday	Labor Day
September	6	Tuesday	First Day of Classes
September	10	Saturday	Saturday Classes Begin
September	12	Monday	Last Day to Add/Drop a Class
September	12	Monday	Last Day for 100% Refund, Full or Partial
September	13	Tuesday	W Grades Posted for Course Withdrawals
September	19	Monday	Last Day for 90% Refund, Full or Partial Withdrawal - no refund for partial withdrawal after this date
October	3	Monday	Last Day for 50% Refund, Full Withdrawal
October	24	Monday	Last day for 25% Refund, Full Withdrawal
November	7	Monday	Last Day to Withdraw
November	22	Tuesday	Thursday Classes Meet
November	23	Wednesday	Friday Classes Meet
November	24	Thursday	Thanksgiving Recess Begins
November	27	Sunday	Thanksgiving Recess Ends
December	14	Wednesday	Last Day of Classes
December	15	Thursday	Reading Day
December	16	Friday	Final Exams Begin
December	22	Thursday	Final Exams End

Good on-line general textbook sources:

1. Chem1 virtual chemistry textbook: http://www.chem1.com/acad/webtext/virtualtextbook.html
2. chemMystery is actually geared for high school but a lot of it applies here too. http://library.thinkquest.org/3659/