Course Change Request

New Course Proposal

Date Submitted: 04/11/20 10:18 am

Viewing: CHEM 322 : Quantitative Chemical Analysis Lecture

Last edit: 04/11/20 10:18 am

Changes proposed by: msikowit

Are you completing this form on someone else's behalf?

No

In Workflow

1. **CHEM Chair**
2. **SC Curriculum Committee**
3. SC Associate Dean
4. Assoc Provost-Undergraduate
5. Registrar-Courses
6. Banner

Approval Path

1. 04/11/20 10:20 am Gerald Weatherspoon (grobert1): Approved for CHEM Chair

Effective Term: Summer 2020

Subject Code: CHEM - Chemistry

Course Number: 322

Bundled Courses:

Is this course replacing another course? No

Equivalent Courses:

Catalog Title: Quantitative Chemical Analysis Lecture

Banner Title: Quant Chem Analysis Lecture

Will section titles vary by semester? No

Credits: 3

Schedule Type: Lecture

Hours of Lecture or Seminar per week: 3

Repeatable: May be only taken once for credit, limited to 3 attempts (N3)

Max Allowable Credits: 9

Default Grade Mode: Undergraduate Regular

Recommended Prerequisite(s):

Recommended Corequisite(s):

Required Prerequisite(s) / Corequisite(s) (Updates only):

CHEM 211, CHEM 212, CHEM 213, CHEM 214, MATH 113, MATH 114

Registrar's Office Use Only - Required Prerequisite(s)/Corequisite(s):

And/Or	(	Course/Test Code	Min Grade/Score	Academic Level	)	Concurrency?

Registration Restrictions (Updates only):

Registrar's Office Use Only - Registration Restrictions:

Field(s) of Study:

Class(es):

Level(s):

Degree(s):

School(s):

Catalog Description:

Lecture portion of CHEM 321.

Justification:

Emergency uncoupling of CHEM 321 lecture and lab for Summer 2020 so that lab can be completed separately once in person instruction begins.

Does this course cover material which crosses into another department? No

Learning Outcomes:

Attach Syllabus

321-hussam-syllabus.pdf

Additional Attachments

Staffing:

Pritha Roy, Abul Hussam

Relationship to Existing Programs:

Equivalent to CHEM 321 lecture

Relationship to Existing Courses:

Equivalent to CHEM 321 lecture

Additional Comments:

Reviewer Comments

Key: 16819

George Mason University
Quantitative Chemical Analysis (CHEM 322)
Robinson Hall A249. M,W 9-10:15 AM. Fall 2020

Instructor: Prof. Abul Hussam
Planetary Hall 337 and 402
Office: Thurs 10 –11:30 AM or by appointment

Goals and requirements of the course

Modern science and technology cannot sustain without quantitative chemical analysis. Precise and accurate measurement of chemical species and chemical analysis of material composition are required by all branches of science. This course is designed to introduce the process and method of chemical analysis - in theory and practice. Since many of you are going to work as a professional chemist, biologist, doctor, environmental scientist, etc., therefore, it is to your advantage to learn one of the most vital tools of the trade i.e., chemical analysis. Students must have passed and learned the general chemistry (CHEM 211 and CHEM 212) to take this course. Students are expected to know and use word processing and spreadsheet programs to write laboratory reports, process laboratory data and solve assigned projects.

Text

Exploring Chemical Analysis (Fifth Edition) by Daniel C. Harris, W. H. Freeman, 2013 and web materials at *www.whfreeman.com/exploringchem5e*. A solution manual for the text is also available for purchase.

Course content

The course is designed to solve problems of practical significance. Particular emphasis will be given on error analysis, chemical equilibria, electrochemical techniques, basic spectrophotometry and separation science. A tentative course schedule is given below. Materials covered in class and a detail syllabus is posted as we proceed.

Lecture	Subject	Chapter	Dates	Quiz
1-3	Analytical Process, Concentration units, Experimental errors, significant figures, error propagation and math toolkit Tools of the trade (Ch 2: A must lab reading material)	0-3	August 28- Sept 6	
4-5	Statistics: Error distribution, t-test, Q-test, calibration curves, linear best fit line. Quality assurance and calibration methods	4-5	Sept 11,13	
6-7	Volumetric analysis: solubility products, Gravimetric analysis, Relation between K's (part from chapter 1-5)	6,7	Sept 18,20	
8	Monoprotic acid-base equilibria	8	Sept 25,27	
9	Buffers and Indicators	9	Oct 2,4	
10	Acid-base titration	10	Oct 9,11	
	Midterm Exam		**Oct 16**	
11,12	Polyprotic acid base: Speciation analysis, Deeper Look	11,12	Oct 18,23	
13	EDTA Titration of Metal ions	13	Oct 25	
14	Electrode Potential	14	Oct 30, Nov 1	
15	Electrode Measurement, Redox Titration	15,16	Nov 6,8	
18,19	Spectrophotometry: Instrument and Application	18,19	Nov 13,15	
21,22	Principles of Chromatography	21,22	Nov 20,27	
23,24	Gas / liquid chromatography, Capillary Electrophoresis	23	Dec 4,6	

Columbus Day:	**Monday, Oct 9 (Monday classes meet Tuesday)**
Midterm exam:	**Monday, Oct 16, 9:00-10:15 AM.**
Last day of class:	**Dec 6, 2016**
Final exam:	**Monday, Dec 18, 7:30-10:15 AM**

Methods of evaluation

Course evaluation and grading are based on homework problems, computer projects, and class quizzes (25%), midterm (15%), cumulative course final exam (20%), and laboratory grade (40%). Exams and quizzes are designed to test your problem solving skills. All exams and quizzes are closed book and closed notes, without multiple choice questions. Lab grades may include pre-lab quiz, lab report, and lab final exam grades. There will be no makeup exams, quizzes, and labs except under circumstances determined by the instructor. Tentative grading scale: (A+) > 90, (A) >85-90, (A-) >80-85, (B) >70-80, (C) 60 -70, (D) <60

Methods of instruction

'Chalk-Talk' and overheads are the primary methods of instruction. Laboratory part of the instruction is based on handling wide range of laboratory chemicals, apparatus, and instruments. Instructor posts materials on web as necessary.

Methods of your learning
Attend class, listen to the lectures, keep a thorough class note, learn from solved problems, example problems, and "ask yourself question". Pay attention to the problems and topics discussed in class. Learn by yourself first before in a group.

Home-study Problems: (Exams and quizzes are based on examples, "Ask yourself question" and HW problems)

Chapter	Topics	Problems
1	Chemical measurements	14,17,23,27,31
3	Math toolkits	13, 15,20
4	Statistics	10,13
5	Quality assurance and calibration methods	11, 14
6	Good Titrations: Solubility Products	5, 10, 17, 20
8	Acids and Bases (Calculate concentrations of all species not just pH)	6, 10, 21, 25, 30 Handout problems
9	Buffers (Do not use Henderson)	3, 10, 20
10	Acid Base Titration	8, 16, Handout problems
11	Polyprotic acid	7, 14, 23, 31
12	A deeper look at chemical equilibrium	11, 18, 22, 29, 33
13	EDTA Titration	8, 20
14	Electrode Potential	13,15, Handout problems
15	Electrode Measurement	15, 17,20
18	Let there be light: Spectrophotometry	15, 19,20
19	Spectrophotometry: Applications	4, 9, 21

Homework problems are not collected for grading except those handout problems. Check the solution manual for details. Problems from chapters on separation chemistry will be assigned later.

Computer Spreadsheet Project Problems

Topics	Chapter, Problems	Due Dates*
Math Toolkit	3-17, 3-24	
Statistics	4-19, 4-20	
More Stat Project	Handout and data from instructor	
Quality assurance and calibration methods	5-12	
Solubility products	6-24 (Lead phosphate)	
Acid Base Titration	10-30	
Polyprotic acid	Handout and data from instructor	
Electrode measurement	15-6 (X'l plot)	
Redox titration	16-7(X'l plot)	
Spectrophotometry	18-24	
Spectrophotometry: Applications	19-14	

Announced in class.